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THE

CYCLOPÆDIA

OF

PRACTICAL MEDICINE.

VOL. II.

THE

CYCLOPÆDIA

OF

PRACTICAL MEDICINE:

COMPRISING

TREATISES ON THE NATURE AND TREATMENT OF DISEASES, MATERIA MEDICA
AND THERAPEUTICS, MEDICAL JURISPRUDENCE, ETC., ETC.

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"Hæc demum sunt quæ non subgessit phantasiæ imaginatricis temeritas sed phænomena practica edocuere."—SYDENHAM.

IN FOUR VOLUMES.

VOL. II.

EMPHYSEMA—INFLAMMATION.

PROSUNT QUÆ OMNIBUS.

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THE
CYCLOPÆDIA
OF
PRACTICAL MEDICINE.

EMPHYSEMA.—This term, derived from the Greek verb ἐμφυσάω, to inflate, is used in medical language to signify the presence of air in the cellular tissue.

The portion of the cellular tissue which is most frequently affected with emphysema is the subcutaneous; but as all the prolongations of this tissue throughout the body are directly continuous, and communicate freely by their areola structure, the air in emphysema, when once effused in any part of it, may extend wherever cellular tissue exists.

Frank remarks that thin persons are more liable to emphysema than those whose cellular tissue is loaded with fat; and it is matter of common observation, that those parts of the body where the cellular tissue is lax and free from fat are most easily affected with this disease. Thus, the eyelids, scrotum, neck, and sides of the thorax, yield readily to the admission of air, while the buttocks and thighs, the arms and legs are much more slowly distended. The dense cellular tissue which lines the serous and mucous membranes yields with still more difficulty to emphysema, and the palms of the hands and soles of the feet are among the last parts to become so affected.

There are two modes in which emphysema may be produced: 1. by the introduction of atmospheric air into the cellular tissue through a solution of its continuity; or, 2. by the development of gas within the cells of the part. The former is termed *traumatic*, the latter *idiopathic* or *spontaneous* emphysema.

Traumatic emphysema is of much more frequent occurrence than the idiopathic species. It may succeed to any wound of the integuments which allows the external air to get into the subjacent cellular tissue; but in a great majority of cases, (amounting to ninety-nine out of the hundred,) it arises from the introduction of air into the common cellular tissue through a communication formed more or less directly with the organs of respiration. The following are the principal ways in which this communication may be established. 1. By wounds or ulcers communicating with the interior of the mouth or nares. 2. By perforation of the larynx or trachea. 3. By rupture of the air-cells and interlobular cellular tissue, the investing membrane or pleura remaining uninjured, and the air escaping through the roots of the lungs and mediastinum into the general cellular tissue. 4. By perforation of the lung, pleura pulmonalis, and pleura costalis. 5. By penetrating wounds of the chest, the lung and its investing membrane remaining uninjured.

1. Wounds or ulcers communicating with the interior of the mouth or nares.—Frank states that emphysema is not unfrequently produced in persons learning to play on the flute, or other wind instruments, in consequence of the air being forced into the parietes of the cheek through any wound or small ulcer which may happen to exist on its internal surface, (De curand. hom. morbis: Art. Pneumatosis.) And M. Rullier informs us that the prisoners in the Bicêtre at Paris, when they wished to be transferred to the infirmary, were in the habit of producing an artificial emphysema of the face and throat, by puncturing the inside of the cheek with a pin, and then forcing the breath through the puncture, (Dict. de Médecine, Art. Emphysème.) In wounds of the under-eyelid communicating with the lachrymal sac, emphysema is not a very uncommon occurrence, the air passing from the nares, through the duct, into the sac, and thence finding its way into the lax cellular tissue in the neighbourhood: in like manner emphysema of the head and face has been observed to take place in cases of fracture of the frontal bone communicating with the interior of the nares.

2. Perforation of the larynx or trachea.—In wounds of the larynx or trachea, part of the air which is expelled from the lungs at each expiration, instead of passing through the glottis, escapes through the wound; but if its free exit is opposed by the narrowness or obliquity of the external orifice, instead of passing out directly, it insinuates itself into the areolæ of the cellular tissue, forming an emphysematous swelling round the wound, and from thence extending all over the body. Instances have also occurred, where, from a severe blow, some of the rings of the trachea have been ruptured; and the same effect has been said to arise from coughing. We are not acquainted with the records of any case in which perforating ulcers of the larynx or trachea have led to the formation of emphysema; a fact which is probably to be accounted for by the air being prevented from entering the cellular tissue by the adhesive inflammation which usually precedes and limits the ulcerative process.

3. Rupture of the air-cells and interlobular cellular tissue, the investing membrane or pleura remaining uninjured, and the air escaping through the roots of the lung and mediastinum into the

general cellular tissue. The rupture of the parietes of the air-cells formed by the ultimate ramifications of the bronchi is by no means an uncommon occurrence; (see EMPHYSEMA OF THE LUNGS;) but so long as the cellular tissue which invests each lobule, and isolates it from those adjoining, remains uninjured, the extravasated air is prevented from escaping beyond the lobule in which the ruptured air-cells are situated. When, however, the cellular tissue which invests each lobule, and which is in fact a prolongation or process of the general cellular tissue, of the body, is likewise lacerated, the air is then at liberty to enter the cells of that tissue which communicate one with another throughout the lung, and through the root of the lung and mediastinum, with the cellular tissue of the throat; so that having once found its way from the ruptured air-cells into the interlobular cellular tissue, it passes uninterruptedly from cell to cell, (when urged forward by a sufficient force,) until it reaches the cellular tissue of the throat, where it makes its appearance in the form of an elastic crepitating tumour over one or both clavicles, and soon becomes diffused over the face and trunk.

This variety of emphysema may be produced by violent fits of straining, coughing, or crying, or any other exertion of the respiratory organs, sufficiently powerful to rupture the air-cells and interlobular cellular tissue; but it has been observed to occur most frequently in women during parturition, and in children severely affected with the hooping-cough. Dr. A. Hamilton, of Edinburgh, observed a case of emphysema produced in this way by the efforts which a young woman made to conceal the pains of labour. She suddenly lost her voice, and her face became swelled in a wonderful manner; her respiration, too, became quick and laborious, and her pulse full and rapid. However, by rubbing the tumid parts twice in the day with camphorated oil, and taking away a considerable quantity of blood from the arm, together with the use of laxative medicines, and an opiate at bed-time, the swelling began to give way in the course of a week; and in proportion as the emphysema disappeared, she recovered her voice. (Halliday on Emphysema.)

Dr. Johnson, the learned professor of Midwifery in the Royal College of Surgeons of Dublin, informs us that six cases of this accident have occurred in his practice. In general the emphysematous swelling is confined to the neighbourhood of the throat, where it first makes its appearance; but in some cases it extends with a frightful rapidity, and involves the entire surface of the body. In one case it extended to the very tips of the fingers. This form of emphysema is likewise occasionally produced by violent paroxysms of the hooping-cough. Dr. Johnson has known it to occur in three cases of this disease; and Dr. Mackintosh of Edinburgh, and the late Dr. Beattie of Dublin, mentioned to us similar cases that had fallen under their observation. An interesting case of this form of emphysema is also recorded by Dr. Ireland, in the third volume of the Dublin Transactions.—"A child nine years old was attacked with pneumonia. Under appropriate treatment the inflammatory symptoms seemed to subside, but a severe cough remained behind, during a violent fit of which a colourless crepitating swelling was observed to form above the clavicles, and extended rapidly until it spread over the whole body. The child died, apparently of suffocation, on the fifth day after the appearance of the emphysema." A case of emphysema of this kind is related by Louis, (Mém. de l'Acad. de Chir. t. iv,) which was produced by the efforts made to expel a bean that had fallen into the larynx. We have, however, had opportunities of observing that a fatal suffocation may be caused by the presence of a foreign body in the air-tubes, without necessarily producing this symptom.

It is probable that many cases of emphysema supposed to be spontaneous are really produced in this manner. Thus, the emphysema which sometimes appears on the sides of the thorax when much force is employed to reduce a dislocation of the humerus, probably arises from the escape of air in the manner we have described, through a rupture of the air-cells caused by the violent efforts which the patient makes to hold in his breath during the reduction of the dislocation. In like manner the emphysematous swellings which have been noticed by Frank, Cullen, and other practical writers, as occasionally occurring during the paroxysms of hysteria, may proceed from the air being forced through the cellular tissue of the lung and mediastinum, by the violent efforts at expiration which are made during the paroxysm, while the aperture of the glottis is kept spasmodically constricted.

The great difficulty of breathing which occurs in this form of emphysema is sufficiently accounted for by the distension of the lung, from the infiltration of its interlobular tissue with air, and by the emphysematous swelling of the mediastinum.

4. Perforation of the lung, pleura pulmonalis, and pleura costalis. This triple lesion may be produced—1. by fracture of the ribs; 2. by penetrating wounds of the chest and lungs; 3. by ulceration. As the emphysema which arises from the first two of these causes belongs more particularly to the province of surgery, we shall notice it very briefly, and refer the reader, who wishes for further details, to the works of surgical writers.

There is no accident which so frequently gives rise to emphysema as fracture of the ribs; for when the sharp ends of the fractured bones protrude through the pleuræ and lacerate the parenchyma of the lung, the air passes freely through the bronchi into the sac of the pleura, and thence through the breach in the costal pleura into the subcutaneous cellular tissue, from whence it becomes diffused all over the body, as there is no opening in the integuments through which it can escape externally. At each dilatation of the chest the air is sucked into the thorax through the lacerated air-cells, and diffused uniformly over the surface of the lung, (supposing that no adhesions exist,) while at each effort of expiration the stratum of air contained within the pleura, being compressed by the contraction of the thoracic parietes against the entire pulmonary surface, is prevented returning by the wound through which it had previously entered; in this way the air continues to accumulate within the sac of the pleura, until it becomes so condensed, especially during the efforts of expiration, as to exert a very considerable degree of pressure on the parietes of the chest, and the important organs contained within it. The air then forces its way through the breach in the costal pleura made by the protrusion of the fractured bone, and escapes into the cellular tissue on the outside of the thorax, whence it is rapidly diffused all over the body, a fresh supply of air being forced out at each expiration, so long as the wound in the lung continues permeable.

From this view of the mechanism by which emphysema is produced in the case of a fractured rib, it is evident that the escape of air into the cellular tissue, which has commonly been looked upon as the most dangerous part of the disease, should with more propriety be regarded as a favourable circumstance, inasmuch as the air which escapes in this way would, if confined within the pleura, oppress not only the lung of that side where it is contained, but, by hindering the play of the diaphragm, and thrusting the mediastinum over into the opposite side, oppress the other lung also, and so produce great difficulty of breathing, or even a fatal suffocation.

In the greater number of cases of emphysema arising from fracture of the ribs, the wound of the lung is soon closed by the effusion of blood, or by adhesive inflammation; after which the further escape of air into the pleura ceases; that already effused is promptly absorbed; the respiration is no longer laborious; the subcutaneous emphysema ceases to extend, and in the course of a few days is removed by absorption.

But in more severe cases the wound of the lung remains unclosed, and a fresh supply of air is pumped into the cellular tissue at each expiration, until the whole body becomes so distended as scarcely to retain a semblance of the human form. The following "History of an Emphysema," from the pen of Dr. William Hunter, is exceedingly characteristic of the appearances produced by excessive distension of the subcutaneous cellular tissue, and of the peculiar difficulty of breathing caused by the pressure of the air accumulated within the sac of the pleura:—"The patient had received a considerable hurt in his side by a fall from his horse. When first seen by Dr. Hunter (twenty-nine hours after the accident,) he was in bed, panting for breath; his form was that of a human skin stuffed. The inflation was great and universal, except in his hands and feet, where it was very inconsiderable. The skin was everywhere shining, as it is when much extended by any kind of swelling. The air could easily be pressed out from any part, but it immediately returned upon taking off the hand. When struck, his body sounded like a wet drum; and when pressed, the air could be felt, and its sound distinctly heard. The cellular membrane was less inflated, and the skin less distended upon his extremities, in proportion nearly to the distance of the part from his chest. Those parts on the surface of the body which have a more loose and yielding cellular membrane were proportionably more swelled; thence his eyelids were so fixed by their own bulk that he had not been able to see light from a few hours after the accident happened. The penis and scrotum were as much distended as in the worst anasarca.

It is impossible to convey a more accurate description of the appearance which this disease presents in its most aggravated form. Dr. Hunter's description of the difficulty of breathing produced by the air accumulated within the sac of the pleura, is equally characteristic: "His breathing was very laborious, and rather frequent, in the following manner:—his inspiration was so short as to be almost instantaneous, and ended with that catch in the throat which is produced by shutting the glottis; after this he strained to expire without any noise; then suddenly opening the glottis, he forced out his breath with a sort of inward groan, and in a hurry, and then quickly inspired again; so that his endeavour seemed to be to keep his lungs always full. Inspiration succeeded expiration as fast as possible. From the small quantity that was inspired and expired at a time, it was plain that he either had not room for a greater quantity, or could not bear a greater expansion of the chest." (Med. Obs. and Inquiries, vol. ii.)

When the surface of the lung is attached by adhesions to the costal pleura, the air which escapes from the wounded lung cannot accumulate within the chest, but passes directly through the corresponding wound of the costal pleura into the cellular tissue on the outside of the thorax; in which case there is no pneumo-thorax, and the difficulty of breathing is consequently much less.

Emphysema may likewise be produced in this way by penetrating wounds of the chest and lungs. It has, however, been observed that these wounds are not as constantly followed by emphysema as fracture of the ribs is. The mechanism by which the emphysema is produced is the same in both cases, the air first escaping through the wounded lung into the sac of the pleura, and thence through the wound of the costal pleura into the subcutaneous cellular tissue. When the wound of the integuments is large, and directly parallel to its internal orifice, the air has an open and unobstructed issue, through which it passes; but when the external wound is narrower than its internal orifice, or only communicates with it obliquely, the air which is forced out may then insinuate itself into the areolæ of the cellular tissue, and thus produce emphysema.

Mr. Hewson endeavoured to produce artificial emphysema by cutting and wounding the lungs of rabbits and dogs in various ways; but all his experiments were unsuccessful: no air was effused either into the cavity of the thorax, or into the cellular membrane. From these experiments he concluded that a puncture or incision of the lungs would seldom produce emphysema, on account of the effusion of blood from the divided vessels, and that the escape of air is more apt to follow a superficial abrasion or laceration of the part, such as is produced by the extremity of a fractured rib; and experience has fully confirmed the accuracy of these conclusions. (See Hennen's Principles of Military Surgery, J. Bell on Wounds, and Baron Larrey's Memoires de Chir. Militaire.)

M. Littre has published a case of emphysema produced by the thrust of a small sword, which is remarkable on account of the enormous distension of the cellular tissue that took place. The emphysema commenced soon after the accident, and the patient died in two days. On examination after death, the emphysematous swelling on the chest measured eleven inches thick, on the belly nine, on the neck six, and four on the other parts of the body; the wound in the lungs was seven or eight lines long, one and a half broad, and one deep. (Mém. de l'Académie Royale des Sciences, for 1713.)

Ulceration of the lung, pleura pulmonalis, and pleura costalis, is the last mode we have enumerated in which a communication may be formed between the interior of the lung and the cellular tissue on the trunk. In some cases a direct communication is thus formed, as when a circumscribed empyema that points externally between the ribs, or an abscess primarily formed in the parietes of the chest, bursts internally into the bronchi, and thus forms a direct communication between the air-passages and the abscess on the thorax. In such cases the pus is evacuated by the bronchi, and its place is supplied with air, which may either infiltrate the cellular tissue of the trunk, producing general emphysema, or, if the walls of the abscess have been rendered impermeable by adhesive inflammation, may be prevented from escaping further, and thus produce a circumscribed emphysematous tumour, bearing the same relation to diffuse emphysema that phlegmonous abscess does to common cellular inflammation. A remarkable case of this kind in which several emphysematous tumours were formed in succession over the surface of the chest and neck, is recorded by Dr. Duncan, in the first volume of the Medico-Chirurgical Transactions of Edinburgh.

This communication may likewise take place indirectly, the air first escaping through an ulcer on the surface of the lungs into the sac of the pleura, producing pneumothorax, and thence, through an ulcer of the costal pleura, into the cellular tissue of the trunk. A remarkable instance of this kind is related by Dr. Halliday. The patient had felt unwell for some days, and on the evening before his admission into hospital was seized with rigors and severe headach; he had also a slight cough, which excited some pain about the superior part of the sternum. Early the next morning he began to complain of great difficulty in respiring; at twelve o'clock the breathing had become more severe, his face was turgid, and his lips quite livid; there was also at this time an unusual fulness of the neck and breast, which, when pressed, yielded an evident crackling noise. In about half an hour after, this fulness was become not only more evident, but was diffused all over the chest, and down both arms; he had now the greatest difficulty in respiring at all, and before one o'clock every part of the surface of his body was become emphysematous, except the palms of his hands and the soles of his feet. On inspection after death, the right lung was found to contain, in its upper lobe, a vomica of about three inches in circumference, from which it appeared that about four ounces of pus had very lately escaped into the sac of the pleura, through an opening which would scarcely admit the head of a probe: upon blowing into the trachea it was observed that the air passed freely through this opening into the sac of the pleura. On searching for the opening through which the air had escaped from the cavity of the thorax, a small part of the pleura costalis, between the sixth and eighth ribs, was discovered with the appearance of being more inflamed than any other part; and nearly in the centre of this small spot an opening was detected, through which the pleura and cellular membrane were easily inflated. (Op. cit.)

5. Emphysema may likewise be produced by penetrating wounds of the chest, even though the lung and pulmonary pleura remain uninjured. The formation of emphysema in such cases may be explained as follows. In all wounds of the chest where the air is admitted into contact with the pulmonary pleura, the lung generally collapses, when not prevented from so doing by emphysema of its tissue, or by old adhesions: a sort of false respiration is then established, air being inspired into the chest through the wound at each dilatation of the thorax, and alternately expired through the same orifice at each contraction of the thoracic parietes. But when, as not unfrequently happens, the wound remains direct and unobstructed during inspiration, but becomes oblique or even closed by the alteration in the relative position of the integuments and ribs during expiration, it follows that the air having a free ingress into the thorax during inspiration, and not having as free an egress during expiration, must suffer such a degree of pressure from the contraction of the chest as to be forced into the subcutaneous tissue, and so produce general emphysema.

The last variety of traumatic emphysema we shall notice is that produced by the escape of air from the alimentary canal, through a rupture of its parietes. It appears from an interesting work, published by MM. Chabert and Huzard, entitled, "Observations sur les Animaux Domestiques," that this accident is not of unfrequent occurrence in ruminating animals, in consequence of their food fermenting and generating such a quantity of gas as ruptures the internal tunic of the intestines, insinuates itself into the subserous cellular tissue, and thence extends all over the body. Haller mentions a case of emphysema produced in this way in a female, whose intestines were so overdistended by the quantity of gas they contained, that they at last gave way and allowed the air to escape into the cellular tissue. (Opusc. Pathol. Obs. xxxi. tom. iii.)

In the eleventh volume of the Archives Générales de Médecine there is a very interesting case of an extensive emphysema produced in this way by a violent contusion on the abdomen.

We have now enumerated the principal varieties of *traumatic* emphysema, and described the mechanism of their formation; but we have yet to consider another form of this disease, in which the air is not introduced from without, but is formed within the cellular tissue of the part, and which, as arising from no very evident cause, has received the denomination of *idiopathic* or *spontaneous*.

The air or gaseous product which is formed in spontaneous emphysema may be produced either by putrefactive decomposition or by secretion.

1. Spontaneous emphysema caused by the extrication of gas from a putrefactive decomposition. The living body is composed of various elements, which are only prevented from decomposing and entering into new combinations by the powers of life, which, by a counteracting influence, prevent the chemical affinities of these elements from coming into full operation; but no sooner do those powers cease to act, than the body begins to decompose under the influence of the chemical and physical laws which govern all inert matter. One of the most constant phenomena of this putrefactive decomposition is the disengagement of various gases; hence it is that dead bodies become emphysematous during putrefaction, and that the bodies of drowned men are after some days buoyed up and float on the surface of the water.

The extrication of gas from the death and decomposition of a part may likewise occur during life, as in the case of gangrene. Indeed this is by no means a rare occurrence, particularly when the gangrene is of the humid species. "I took particular notice (says Dr. Hunter) of the emphysema in a case of mortification from an internal cause, which began upon the ankle, and thence marched upwards upon the limb till it came to the groin, when the patient died. The cellular membrane under the skin was very sensibly inflated every where, to some distance from the mortified part, and I could as easily mark the progress of the mortification from day to day by the emphysema as by the change of colour in the integuments." (Medical Observations and Inquiries, vol. ii.) Practical writers have remarked that gangrene, when accompanied with emphysema, has a remarkable disposition to spread. (James on Inflammation, p. 96.)

The period at which the putrefactive decomposition commences after death depends in a great measure on external circumstances, such as heat, moisture, &c.; but it is also materially influenced by the condition of the fluids, which in some cases have a much greater tendency to putrescency than in others; as is proved by the well-known fact that some bodies will remain for several days without exhibiting any sign of decomposition, while others from the state of the fluids swell up and run into putrefaction immediately after death. In the typhous fever that raged in the south of Ireland during the year 1817, it was found necessary to bury the bodies of those that died within a few hours after death, and to fill up the graves with lime.

The same tendency to putrescence is sometimes observed during *life*, in certain morbid conditions of the economy, which have hence obtained the name of *putrid* or *malignant diseases*. We know, from direct experiment, that the introduction of certain deleterious substances into the blood, such as pus, putrid animal matter, and certain poisons from the animal, vegetable, or mineral kingdom, produces certain alterations in it, by which it loses its power of coagulating, and acquires a tendency to rapid decomposition. Similar alterations are likewise produced in the blood by the sting or bite of certain animals, especially those of the serpent tribe; and are also observed in the spasmodic cholera, the plague, and other diseases of a malignant nature, as it is termed; in all which some of the most constant phenomena are a sudden prostration of strength, a constant tendency to hemorrhage, and a remarkable disposition to mortification wherever congestions are formed, (Andral's Pathol. Anat.) In such cases the *vis vitæ* is actually diminished throughout the whole system, and the laws which govern all inorganic matter begin to exert their influence over the body while yet alive, producing, amongst other symptoms of decomposition, spontaneous emphysema.

"A full-bodied middle-aged sailor was seized with a putrid fever and sore throat; he was bled at the beginning, *but his blood appearing in a loose dissolving state*, he was bled no more: about the seventh or eighth day of his disease, an emphysematous swelling appeared in his face, neck, and all over his breast, especially on the right side; the swelling was fomented with sharp vinegar and camphorated spirit of wine, and under this treatment totally vanished in two or three days, and he soon recovered from the fever; but he continued very weak for a long time, and remained very scorbutic as he was before the fever, his gums being very spongy and bleeding on the slightest touch. In this case the emphysema was generated merely by the putrescence of the humours, as is frequently observed in a less degree in and about the incipient gangrene of the limbs; and I am persuaded that this more frequently happens in putrid malignant fevers than is commonly imagined, (*Huxham*, Medical Observations and Inquiries, vol. iii. p. 33.)

Frank states that the epidemic fever which raged at Bobbio, a small town in Italy, in 1789, frequently terminated in general emphysema; and that a similar epidemic had previously occurred in Germany in 1772, during which emphysematous swellings suddenly appeared on the face and neck, and sometimes extended all over the body, (De Curandis Hominum Morbis, tom. iv. Pt. I. *Pneumatosis.*)

Neither is this development of gas from the decomposition of the fluids peculiar to man. Dr. William Hunter has transmitted to us the history of an epidemical distemper prevalent among the black cattle in the neighbourhood of London, in which it was observed. At first, almost all died that were taken ill of it; most of the diseased were emphysematous all over their body; and on dissection the emphysema was found to be universal upon all the internal parts, as well as under the skin, (Op. cit. vol. ii.) Frank likewise alludes to an epidemic dysentery among the black cattle, during the progress of which the loins and back were frequently observed to become emphysematous.

The last illustration which we shall adduce is one lately exhibited in Paris, at the Hôpital Cochin, an account of which was read by M. Bally at the Académie Royale de Médecine. A man, twenty-five years of age, who had been ill for fifteen days, was admitted into the hospital with symptoms of typhous fever; he also complained of pain in the left thigh; and, whilst he was in a state of delirium, said he had been bitten on the knee by a dog. The limb was most attentively examined, but not the slightest trace of such an accident could be discovered. The thigh and scrotum were much swollen. He died the following day. On dissection, *eight hours after death*, the surface of the body was found soiled by blood, which had transuded through the integuments; and some blood had also been discharged from the nose. The whole body was emphysematous, but the left inferior extremity was so to a very high degree. It was double its natural size, of a brown colour, and covered with numerous phlyctenæ—some black, of great extent, and collected in clusters, from which escaped a reddish serous fluid mingled with a quantity of gas; others white, from which nothing but air escaped. When the limb was pressed with the hand, crepitation was distinctly heard; the abdomen was much distended with gas; and in the intestines were observed those alterations that are so common in cases of typhous fever. Bubbles of air filled the vessels of the pia mater, and the left vena saphena. The lymphatic ganglions of the mesentery were enlarged and contained gas, *which took fire from the flame of a taper*, and produced an explosion; the same phenomenon also followed the exit of the air which was contained in the legs, thighs, and scrotum. A puncture was made into the abdomen, and the gas which escaped also took fire and burned for some time, the flame being blue at its base, and white at its summit: the combustion extended to the puncture which had been made with a trochar; the edges of this aperture became black, and were consumed, and the aperture itself was enlarged to double its original size. The gas which was contained in the subcutaneous cellular tissue was equally inflammable, (London Medical and Physical Journal, for June, 1831.)

This case is peculiarly interesting in consequence of the light it throws on the etiology of spontaneous combustion. On referring to the article on this subject it will be found that, in all those cases of spontaneous combustion of which we have an authentic history, the flame was communicated by the contact of a body in a state of ignition, and it is reasonable to suppose that the combustion was likewise supported by an inflammable gas generated within the body, as in the present instance.

Some doubt may be entertained whether this inflammable gas should be considered as the product of a putrescent decomposition formed by the ordinary laws of chemical attraction; or as a morbid secretion, the product of a vital action, and regulated by the same vital laws as other secretions.

On this subject much yet remains to be discovered, as our present knowledge only amounts to this, that collections of air are sometimes found in the living body, under circumstances where there is no appearance of their having been generated by fermentation or putrefaction; and that both in man and other animals, certain tissues possess the power of secreting gas, as, for instance, the swimming bladder in fish, the mucous membrane of the stomach and intestines in man, and the mucous membrane of the air-passages, which, as the accurate experiments of Dr. Edwards clearly prove, secretes a variable quantity of carbonic acid and azetic gases. The fact of a gaseous secretion being formed by certain tissues in the healthy state being established, we are authorized by analogy to conclude that a secretion of gas may, like other secretions, take place as a morbid phenomenon in parts where no such secretion naturally occurs, more especially as we possess several well-authenticated cases in which it is impossible to account for the presence of the gas in any other way. It must, however, be confessed that we are completely ignorant of the causes that influence the production of gaseous secretions, and of the condition of the solids or fluids most favourable to their development: if they are preceded or accompanied by any alterations of texture, they are such as entirely to escape our notice. The chemical composition of these secretions is also a desideratum.

Such being the state of our knowledge, we shall not enter into the consideration of any of the hypotheses which have been formed on this subject, but merely notice the fact, generally admitted by pathologists, that spontaneous emphysema is occasionally produced by a secretion of gas within the areolæ of the cellular tissue.

Dr. Baillie has recorded a very remarkable case of this kind, in which the emphysema was so extensive as to affect the alimentary canal and the mesentery, as well as the whole of the subcutaneous tissue; yet in which there was no solution of continuity through which the air could have been introduced, and no appearance of any putrefactive decomposition, by which it could have been generated. Frank likewise relates several cases of spontaneous emphysema, which it is difficult to account for on any other supposition than that of their being a product of morbid secretion; such, for instance, is the case of a young lady at Vienna, who became generally emphysematous during every paroxysm of a tertian fever, the emphysema disappearing as the paroxysm subsided. Many other curious instances of this disease are to be found in the chapter on PNEUMATOSIS, in the 8th volume of this author's work "De Curandis Hominum Morbis."

The *diagnosis* of emphysema seldom presents any difficulty when the disease affects the subcutaneous tissue, as it then produces an uniform swelling, sufficiently characterized by its lightness and elasticity, and by the peculiar crepitating sound and feel it yields under the finger, from the displacement of the air from one cell into another.

The *prognosis* must be regulated more by the cause of the emphysema, and the state of the respiratory organs, than by the extent of the emphysematous swelling. The emphysematous distension of the integuments is much more formidable in appearance than in reality, and, when unconnected with any lesion of the organs of respiration, may be very extensively diffused without producing any injurious consequences. Aristotle says that it was a common practice in his time to inflate the subcutaneous tissue of animals in order to make them fatten more readily afterwards: this practice is also alluded to by Pliny; and Schulze states that the only effect it produces on horned cattle is to render them dull and heavy for two or three days, after which time the emphysema gradually disappears, they recover their spirits and appetite, and in the course of six weeks become quite fat. (Dictionnaire des Sciences Médicales. Art. *Emphysème.*) Haller and

Soemmering likewise attest the truth of these observations, which at least serve to prove that the effusion of air into the cellular tissue is not in itself productive of much injury, and that the sense of suffocation, and other formidable symptoms which so often accompany the progress of this affection, depend more on the diseases with which the emphysema is complicated than on the emphysema itself. This conclusion is further confirmed by the result of those cases of emphysema that have been observed in the human subject, uncomplicated with any lesion of the organs of respiration. Sauvages mentions the case of a soldier, who was found asleep in a cave by some persons, who inflated his body through a quill until it scarcely retained a vestige of the human form, — all the lines of demarcation between the face, throat, and trunk, being completely destroyed. In this case, which may be regarded as a rare example of general and extensive emphysema unconnected with any lesion of the respiratory organs, the principal symptoms observed were pain and stiffness from the overdistension of the integuments, and difficulty of breathing from the impeded motion of the thorax, and the congestion of the lungs, arising from the pressure which the superficial blood-vessels sustained; these symptoms disappeared as the air was evacuated through several scarifications which the patient had given himself with a knife, and his recovery was rapid and complete.

We may, therefore, conclude that the extreme difficulty of breathing, which so frequently accompanies traumatic emphysema, and which is in almost every instance the immediate cause of death in those cases that prove fatal, is in reality produced, not by the emphysematous distension of the integuments, but by the air effused into the sac of the pleura, or into the interlobular tissue of the lung.

Treatment. — The practice in emphysema must be regulated in a great measure by the cause of the affection, the extent of the emphysematous swellings, and the state of the respiration: the general indications of cure may, however, be arranged under three heads: 1. to arrest the progress of the emphysema, by preventing a further effusion of air into the cellular tissue; 2. to remove the air already effused; and, 3. to relieve the disordered state of the respiration. The means employed for the fulfilment of the first indication must be regulated by the cause of the emphysema.

In *spontaneous emphysema*, the only effectual method of arresting the further progress of the disease is, to correct the morbid state of the system on which the development of the gas depends, and of which it is merely a symptom. As it generally occurs during the progress of asthenic or typhoid diseases, aromatic and stimulating liniments should be applied externally, in order to promote the action of the capillaries, while the proper remedies adapted to the disease are administered internally. Should the emphysema spread extensively, it may be proper to relieve the distension of the swollen parts by puncturing them with the point of a lancet.

In *traumatic emphysema*, arising from wounds of the larynx or trachea, the further effusion of air into the cellular tissue may be prevented by enlarging the external orifice of the wound, so as to make a direct passage for the exit of the air during expiration; the same practice should also be adopted when the emphysema arises from penetrating wounds of the chest, after which the wound should be closed with adhesive plaster.

When the emphysema arises from a fractured rib, the further effusion of air into the cellular tissue may be prevented by applying a tight roller round the chest, or by making a small puncture through the integuments over the seat of the fracture.

When the breathing is not much oppressed, the application of a bandage may be employed with safety and advantage. But as (supposing that the surface of the lung is not adherent) the air is effused from the wounded lung into the sac of the pleura, before it escapes into the cellular tissue, it is plain that by applying a bandage round the chest, in order to prevent the further progress of the emphysema, we only confine the air within the pleura, where if it continues to accumulate, its presence must give rise to all the distressing symptoms of pneumothorax, as it not only compresses the wounded lung, but, by its pressure on the mediastinum and diaphragm, obstructs the dilatation of the other lung also: under such circumstances every facility for the enlargement of the chest becomes necessary, in order to admit as much air as possible into the lung, which still executes its functions; but the effect of the bandage is to diminish the dilatation of the sound side as well as that of the diseased, and, consequently, to increase still farther the embarrassment of the respiration.

For these reasons, it is much safer, where the breathing is at all embarrassed, to let the air escape by making several punctures or small incisions over the broken rib, than to confine it with a bandage, though the latter practice may be employed with advantage in those cases where the quantity of air effused into the chest is not sufficient to produce much dyspnœa or oppression.

Lastly, in the cases of emphysema arising from over-distension and rupture of the air-cells, and the escape of air into the interlobular tissue of the lungs, and thence through the mediastinum into the common cellular tissue, the only method of arresting the further effusion of air is by employing such means as are calculated to diminish the violence of the respiratory efforts by which the air is forced, at each respiration, into the mediastinum. With this view copious venesection should be employed, for the double purpose of relieving the pulmonary congestion, and of diminishing the mass of the circulating fluid; for, by lessening the quantity of blood to be aerated, we also lessen the necessity for taking in so large a supply of air for its aeration, and in the same proportion diminish the efforts made by the muscles of respiration to dilate and contract the thorax. Opiates should likewise be employed with the same intent, to diminish, as Laennec expresses it, "le besoin de respirer:" rest and silence should be enjoined, and the antiphlogistic regimen strictly enforced.

We next come to consider the means of removing the air already effused into the cellular tissue. In the slighter cases of emphysema, where the breathing is not much oppressed, and the quantity of air effused is not very great, the power of the absorbents will generally be found sufficient for its removal, and it will only be necessary to employ friction over the tumid parts with camphorated liniment, or some other stimulating embrocation, for the purpose of accelerating the process of absorption : but when the quantity of air effused into the cellular tissue is so great as to produce considerable distension of the integuments, it will be advisable to make several punctures, with the point of a lancet, through the skin where it is most distended, in order to evacuate the air contained underneath. These punctures or scarifications should be made sufficiently deep to divide the cellular tissue, in order to make a free exit for the air from the deep-seated as well as from the superficial cells. If the air should have spread extensively over the body, it will be more advisable to puncture the skin wherever the parts are much inflated, than to press it along under the skin to the punctures which may have been made in a distant part. This practice should be adopted in all cases of extensive emphysema, from whatever cause it may have arisen; as it is perfectly free from danger, and affords immediate relief to the suffering arising from over-distension of the swollen parts, and likewise obviates the danger of the air forcing its way into the cellular tissue of the internal organs.

We have already seen that in the great majority of the cases of traumatic emphysema, the organs of respiration are more or less injured, and that it is from the injury which they sustain that the most distressing and dangerous symptoms invariably arise. To them, therefore, our principal attention should always be directed, as the most important object of our treatment. In all cases of extensive emphysema the breathing is more or less oppressed, in consequence of the diminished mobility of the thorax, and the congested state of the lungs caused by the increased quantity of blood thrown on them from the surface of the body. In such cases, therefore, it will be proper to relieve the internal congestions by copious bloodletting, and to remove the pressure which impedes the motion of the thorax, by evacuating the air confined under the integuments, as already directed. Venesection is also useful in such cases, as the most powerful means we possess of anticipating or arresting the development of inflammation.

Should these measures prove insufficient for the relief of the breathing, we may then infer, (especially when the sense of oppression and suffocation continues progressively increasing, and other symptoms indicate the existence of pneumothorax,) that air is accumulating within the chest, so as to oppress not the wounded lung only, which was collapsed and useless from the first, but the diaphragm and mediastinum, and through them the opposite lung also. A freer incision should then be made through the integuments over the seat of the injury, and if this does not afford sufficient vent to the air confined within, the incision should be continued through the intercostal muscles, and a small puncture cautiously made into the pleura. Mr. Hewson, who has written an excellent paper on this subject, in the third volume of the Medical Observations and Inquiries, recommends that the operation should be performed, as in cases of emphysema, on the fore part of the chest, between the fifth and sixth ribs at the right side, as there the integuments are thin, and in the case of air no depending drain is required ; but if the disease is on the left side, he considers it more advisable to make the opening between the seventh and eighth, or eighth and ninth ribs, in order that we may be sure of avoiding the pericardium. The perforation of the pleura will be immediately followed by the escape of the condensed air, the pressure of which being removed, the mediastinum and diaphragm will regain their natural position, and the opposite lung will thus be enabled to resume the free and unobstructed discharge of its functions; after which the wound should immediately be closed with adhesive plaster, in order to prevent the alternate ingress and egress of air during the dilatations and contractions of the thorax. Should the symptoms of oppression and suffocation again return, the wound may be opened as occasion requires, and the accumulated air suffered to escape.

It sometimes happens that the necessity of performing the operation of paracentesis is apparent from the oppressed state of the breathing, and other urgent symptoms of pneumothorax, but that from the nature of the accident, and the extreme distension of the integuments, it is difficult to ascertain at which side the operation should be performed;—a point in reference to which an error may be attended with the most fatal consequences, as actually occurred in a case recorded by Dr. Halliday. "The operation of paracentesis was resolved on in consultation, and an incision was accordingly made between the sixth and seventh ribs on the *left side* of the thorax. As soon as the opening was made into the cavity of the chest, every distressing symptom became more severe, and the patient scarcely survived a quarter of an hour." On dissection, it was discovered that the operation had been performed on the sound side. (Op. cit.)

In order to avoid the possibility of committing so fatal a mistake, the existence of pneumothorax, and its precise seat, should always be clearly ascertained by the physical signs of this disease furnished by auscultation and percussion (see PNEUMOTHORAX) before the operation is undertaken; and should the emphysematous state of the integuments prevent their employment, or obscure the indications which they afford, several punctures should be made over the chest, and the air pressed towards them, until the emphysematous swellings are reduced ; after which, the precise extent and seat of the pneumothorax may be ascertained with that degree of accuracy which the labours of Laennec have rendered so characteristic of this department of medical science.

Some writers use the term emphysema in a more extended signification than that which has been assigned to it in this article, and apply it to all preternatural accumulations of air, in whatever part of the body they are situated. But, as these collections of air have each received distinct names, according to the cavities or organs in which they are situated, such as pneumothorax, tympanitis, physometra, &c., their description will find a more appropriate place in the articles respectively allotted to these subjects. Emphysema of the lungs alone forms an exception, and will therefore be treated of in the next article.

R. Townsend.

EMPHYSEMA OF THE LUNGS.—The morbid appearances presented by this disease have been noticed by Bonetus, Morgagni, Van Swieten, Storck, and other anatomists. In this country we have a very correct account of an emphysematous lung from the pen of Sir John Floyer; and Dr. Baillie's work on Morbid Anatomy contains an accurate description of the three principal circumstances which characterize this lesion, namely, the great size of the lungs, the dilatation of the cells, and the vesicles formed by extravasation of air under the pleura. The discovery of its frequent occurrence as a disease, of its etiology, and diagnosis, was, however, reserved for the pathological researches of M. Laennec. [An excellent essay on the subject has been published by M. Louis (translated by Dr. T. Stewardson of Philadelphia, in Dunglison's *Medical Library* for 1838.) In order to render the following observations intelligible, it will be necessary to premise a few observations on the anatomical structure of the pulmonary parenchyma, as the emphysematous condition of this viscus is, in many cases, merely an exaggeration of its natural or healthy structure.

If we examine in a good light the surface of a sound lung, we can ascertain by the naked eye, through the transparent pleura, that its parenchyma is formed by the aggregation of a multitude of small vesicles of an irregularly spheroid or ovoid figure, full of air, and separated from each other by opaque white partitions. These vesicles, which on the surface of the lungs have the appearance of small transparent points, are not of an uniform size; the largest are equal to the third or fourth part of a millet-seed. They are grouped in masses or lobules, divided from each other by partitions of closely condensed cellular membrane, very thin, yet thicker and more opaque than the partitions between the individual cells. These partitions traverse the pulmonary substance in all directions, and crossing each other under various angles, form figures of different shapes, such as lozenges, squares, trapeziums, or irregular triangles, the bounding lines of which are rendered still more defined by the black pulmonary matter that is deposited along them. (Forbes's Translation of Laennec.)

If we analyze this structure, we find that it is composed, 1st, of the minuter ramifications of the bronchi, which go on subdividing and diminishing in caliber until they terminate each in a cul-de-sac or air-cell, as it is commonly termed, of extreme delicacy and minuteness, on the parietes of which the pulmonary vessels ramify in an extreme state of fineness, (*Reisseisen*, De Structurâ Pulmonum;) and 2dly, of the common cellular membrane which serves to connect these air-cells together, and which likewise forms several membranous partitions that divide each lobe into a number of distinct lobules, and is hence termed the *interlobular cellular tissue*, each lobule being as perfectly isolated from those adjoining it by this partition, as each lobe is by its investiture of pleura.

Each of these textures is liable to emphysema, and hence we have two varieties of this disease in the lung: 1. *the vesicular or true pulmonary emphysema*, (as it is somewhat arbitrarily termed by Laennec,) formed by the dilatation of the minute bronchi and air-cells, or by the rupture of their parietes, by which several contiguous cells are thrown into one; 2. *the interlobular emphysema*, formed by the infiltration of air into the interlobular cellular tissue. The former usually occurs as a chronic disease, while the latter as generally assumes the character of an acute affection.

I. Pulmonary or Vesicular Emphysema.—In pulmonary emphysema, the size of the air-cells is much increased and is less uniform. The greater number equal or exceed the size of a millet-seed, while some attain the magnitude of hemp-seed, cherry-stones, or even French beans. (Laennec.) We are disposed to think, however, that cavities of such a size are rarely formed by the dilatation of individual cells, as in more than one hundred dissections which we have made of pulmonary emphysema, we never except in one instance saw the air-cells dilated to the size of a garden-pea; in the great majority of cases the cavities of this size, or even of a less diameter, are formed by several cells being thrown into one, in consequence of their delicate partitions being overstrained and ruptured. In some cases, the walls of the cells disappear from one entire lobule, leaving only some lacerated filaments traversing its cavity from one interlobular partition to another, and in some instances these partitions are also lacerated, and their respective lobules are thus thrown into one large cavity, which usually reaches the surface of the lung, and forms a projection under the pleura. In order to see these alterations of structure, it is necessary to inflate the lung and dry it previous to examination, as without this precaution the cells collapse immediately when cut into, and all appearance of emphysema is consequently lost.

"Emphysema may affect both lungs at the same time, one only, or a part of one, or both: in the latter case, and, indeed, in any case, as long as the disease is confined to a simple dilatation of the cells, or to the rupture of a few of their partitions, and does not form vesicles of any considerable size on the surface of the lung, it may be easily overlooked in the dead body; for this reason, the disease, which is really one of the most constant morbid appearances in all cases of protracted dyspnœa, has been as constantly overlooked, and in this way the lungs of asthmatic patients have been regarded as healthy when they are in reality emphysematous, and cases of dyspnœa set down as nervous or idiopathic, for which anatomy has now discovered an organic cause.

"When the disease exists in a very high degree, we cannot help being struck with the appearance of the parts. The lungs seem as if confined within their natural cavity, and when exposed, instead of collapsing as usual, they rise in some degree, and project beyond the borders of the thorax. If we examine them in this state, they feel firmer than natural, and it is more than usually difficult to flatten them. The crepitation they yield on pressure, or being cut into, is less, and of a kind somewhat different; it is more like the sound produced by the slow escape of air from a pair of bellows, and the air makes its escape from the cells much slower than in a healthy state of the organ. When we detach the lung, the crepitation is found to be still less perceptible, and the sensation conveyed by pressing the parts is very like that produced by handling a pillow of down. On placing an emphysematous lung in a vessel of water, it sinks much less than a healthy lung, and sometimes it floats on the surface with scarcely any obvious immersion. The pulmonary tissue is drier in a lung affected with emphysema than in a healthy one, and it is unusual to find even towards the roots of the lungs any trace of the common serous or sanguineous infiltrations usually found after death." (Forbes's translation of Laennec.) In some cases, however, especially when the heart is diseased, and the pulmonary circulation much obstructed, the emphysematous lung becomes red and congested.

It seldom happens that emphysema exists to the extent so admirably described in the preceding paragraph, without occasioning the rupture of several of the dilated cells, and it is by no means uncommon to find one or more large vesicular cavities formed, each by the re-union of all the air-cells of one entire lobule, and bounded by its interlobular partitions, which often remain uninjured when the texture of the air-cells which they enclose is completely destroyed; in extreme cases these interlobular partitions give way likewise, and several lobules are then thrown into one large vesicular cavity, resembling more a bladder filled with air, or the vesicular lung of a frog, than the parenchymatous texture of the human lung. These alterations are most frequently observed at the margin of the lung or at its base where it reposes on the diaphragm.

From these observations it results that emphysema of the lung essentially consists in the rarefaction of its parenchyma, produced either by the dilatation of its cells, or the rupture of their parietes. These lesions may be referred to three principal causes: 1. hypertrophy; 2. atrophy; 3. over-distension of the air-cells.

1. *Hypertrophy.*—Laennec has remarked that in several cases where the lung has been rendered incapable of performing its functions, the other, having double duty to perform, acquires an increase of volume proportionate to its increased activity of function. This increase of size appears to result from an increase in the capacity of the capillary bronchi and air-cells, at the same time that their parietes are increased in thickness; indeed, this is rendered very evident by inflating and drying the lung, for when after this process it is cut into slices, we at once perceive some cells much larger than in the natural state, and likewise their parietes much thicker than they usually are. The state of the air-cells in this form of emphysema may be considered as analagous to the hypertrophy with dilatation of the heart and other hollow muscles.

2. *Atrophy of the Lung.*—Whenever any cause continues for a certain length of time to impede the free entrance of air into the pulmonary cells, those cells diminish in number, and the parenchyma of the lung falls into a state of atrophy. Accordingly we find this atrophy invariably taking place in lungs which have been compressed by pleuritic effusions of long standing, or when the principal bronchial tube is compressed by external tumours. In old age, likewise, the lungs sometimes undergo so considerable a degree of atrophy that the chest is visibly contracted in consequence; and in such persons they are small, contain very little blood, are remarkably light, and their whole texture appears rarefied. If we inflate and dry a lung in this state, we perceive a remarkable alteration in the disposition of the ultimate bronchial ramifications, and of the air-cells in which they terminate; they no longer form distinct cavities, separated from each other by complete septa: at first these septa are only reduced to a state of extreme tenuity, but at a later period some of them appear perforated in one or more points, while others seem ruptured and irregularly torn. In some cases the walls of the cells disappear altogether, and we only find in their stead some delicate filaments traversing in different directions cavities of various sizes. In the parts of the lung where these alterations exist, there are no longer to be found either bronchial ramifications, or air-cells, properly so called, but merely vesicles of greater or less diameter, divided into compartments by imperfect septa or irregular laminæ, bearing a perfect resemblance to the lungs of cold-blooded animals. (Andral's Pathological Anatomy.)

Thus we see how lesions the most opposite in their characters, hypertrophy and atrophy, may alike produce this disease. But in the case of hypertrophy there is only dilatation of the cells without laceration of their parietes, unless as an accidental occurrence; whereas, in atrophy of the lung, large cavities are formed by several cells being thrown into one by the extenuation and rupture of their walls. Hence arises this important difference, that in the first case the number of surfaces on which the blood is exposed to the action of the air remains the same, while in the second the number of these surfaces is considerably diminished. It is easy to see that the respiration will not be equally affected in these two cases, and that the dyspnœa must necessarily be more considerable in the latter. There is, however, one circumstance that occurs in old age (at which period this alteration, as already stated, most generally occurs,) which prevents the respiration from being as much embarrassed as we might *à priori* have expected,—namely, the diminution that takes place in the quantity of the blood, or (what comes to the same thing) the diminution in the rapidity of the circulation. For this reason atrophy of the lung, when occurring in old age, should rather be regarded as a natural phenomenon resulting from the fulfilment of a law in the animal economy which establishes a constant proportion between the quantity of blood to be aerated in a given time, and the extent of surface on which this aeration is to be accomplished. Thus we find that the lung has its maximum of density in infants, and in those animals that have either a very rapid circulation or a very large supply of blood, and that, on the contrary, the density of the lung is at its minimum in old persons, and in such animals as receive into their lungs, at each round of the circulation, only a small proportion of the blood contained in their circulating system, (*Andral*, Op. cit.)

Besides these, which may be considered as the physiological causes of pulmonary emphysema, there are others which produce a similar condition of the organ in a manner purely mechanical; by keeping the air-cells in a state of over-distension. Amongst these may be enumerated violent efforts of any kind (especially if often renewed) which cause the long-continued retention of the breath; repeated attacks of catarrh, bronchitis, asthma, or other diseases of the lungs or air-tubes, attended with difficulty of breathing, or distressing paroxysms of coughing.

The mechanism of the over-distension and rupture of the air-cells in these cases may be explained by the efforts which are constantly made by the powerful muscles of inspiration to introduce a fresh supply of air into the air-cells, while that which they contain is prevented from escaping by pellets of viscid mucus, spasmodic stricture of the bronchi, or turgescence of the bronchial membrane, according to the nature of the disease which produced the dyspnœa. In this way, the air-cells are kept in a state of over-distension which the efforts that are made to evacuate them only tend to confirm and increase; and provided the obstruction is of some continuance, the dilated condition of the cells will be rendered permanent, or else their parietes will give way, and allow several cells to be thrown into one.

From this view of the matter, it will readily be understood why all diseases accompanied by protracted attacks of dyspnœa, or violent and often repeated paroxysms of coughing, are so constantly followed by emphysema, especially when occurring in persons advanced in life, in whom, as we have already explained, the lungs are peculiarly predisposed to this disease by the atrophy which their parenchymatous texture naturally undergoes at this period of life. But though the over-distension and rupture of the air-cells is in general a slow process produced by long-repeated efforts to overcome an obstruction to the free exit of their contents, and is consequently the result, in most cases, of some chronic affections of the bronchial tubes, such as dry catarrh, asthma, or the congested state of the mucous membrane, so frequently produced by organic lesions of the heart; it may likewise be produced in a very short space of time, when the efforts made by the muscles of respiration are violent and constantly repeated. We have frequently found the lungs emphysematous in children dying of hooping-cough; and in one instance, where the hooping-cough had not lasted longer than three weeks, we saw several cells dilated to the size of garden-peas, of a globular form, and with their parietes evidently hypertrophied.

[The disease is considered by some to be the result of bronchitis — the mucous secretion of which cannot readily be expectorated, and therefore dilates the vesicles; but this is denied by M. Louis, because, in the cases which he observed, the emphysema was rarely preceded by bronchitis, and the bronchial tubes, in the vicinity of the dilated vesicles, were found empty, containing neither mucus nor false membrane. A recent writer, Dr. G. Budd, ascribes it to a want of elasticity of the lung, or, in other words, to absence of its natural tendency to collapse. The powerful muscles of inspiration are continually acting to dilate the chest, and thence, by virtue of atmospheric pressure, the air-cells. This agency is not counteracted, as it should be, by the natural elasticity of the lung, and the air-cells, as well as the cavity of the chest, are, in consequence, permanently dilated.

The question as to its hereditary nature was closely, and ably investigated by the late Dr. J. Jackson, Jun., of Boston, who attained the following results. *First.* Of twenty-eight patients, affected with pulmonary emphysema, eighteen were the offspring of parents, one of whom had been attacked with the same affection, and several of whom had died in the course of it. In some cases, the same was true of the brothers and sisters. *Secondly.* Of fifty individuals, not affected with emphysema, three only were descended of parents who laboured under the disease; whence it would follow, that emphysema is frequently an hereditary affection. It would appear, too, that hereditary influence is much more marked, where the emphysema dates from early infancy, than in those in whom it commences immediately before, or subsequently to the age of twenty.]

From whatever cause the emphysema proceeds, its constant effect is to render the portion of lung affected incapable of performing its respiratory functions, as is evident from the absence of respiratory murmur in the part during life, and the difficulty with which the air escapes from the overstrained or ruptured cells, even after the lung has been removed from the body. Moreover, as the emphysema is in almost every instance originally produced by turgescence of the bronchial membrane, or spasm of the circular fibres, so from an effect it generally becomes a cause, and maintains the disease by which it was originally excited. Accordingly we find that persons labouring under emphysema of the lung are particularly liable to attacks of asthma and bronchitis, and, as a consequence of the latter, and of the efforts made during respiration, to hypertrophy or dilatation of the heart. These intercurrent diseases usually occur only after long intervals during the first years of the disease; but when the complaint is of long standing, and the patient is far advanced in life, the paroxysms become more frequent and more severe, each succeeding attack increases the extent of the organic lesions and rupture of the pulmonary tissues, and sometimes interlobular emphysema then ensues.

From these observations it may be concluded that pulmonary emphysema in a moderate degree is not a disease of great severity, and that the principal danger is to be apprehended from the repeated attacks of bronchial disease by which the emphysematous condition of the lung was originally produced, and to which, in its turn, it seems to act as a predisposing cause.

From the pathology of emphysema, its diagnosis and treatment may be easily deduced. The dyspnœa, which is its most constant symptom, depends in a great measure on the extent of the disease, and the age and constitution of the individual. When the emphysema is rapidly formed, occupies an extensive portion of the lung, and occurs in a young plethoric subject, through whose lungs a large quantity of blood is constantly in circulation, the dyspnœa which ensues may be so great as to terminate rapidly in asphyxia. But when, as is much more frequently the case, the emphysema commences slowly and proceeds gradually, the disease is in itself seldom attended with any immediate danger, although it renders the organ obnoxious to serious or even fatal effects from contingent pulmonary disease, which in a healthy lung might be borne with comparative impunity.

The difficulty of breathing which accompanies this disease is constant, but is aggravated by paroxysms, which are irregular both in the period of their return and their duration; it is likewise increased by all causes which usually increase dyspnœa from whatever source arising, such as the action of digestion, flatulence in the stomach or bowels, anxiety, living in elevated situations, strong exercise, running, or ascending a height, and above all by the supervention of an acute catarrh, to which, as already stated, persons affected with emphysema are peculiarly liable. Between the paroxysms there is no fever, and the pulse is generally regular. In slight cases the complexion and habit of body are little altered; but when the affection is more considerable, the skin usually assumes a dull earthy hue, with a slight shade of blue interspersed, and the lips become violet, thick, and swollen; there is likewise more or less of cough usually present, though it is sometimes so slight as to escape the notice of the patient: the expectoration generally consists of a greyish viscid mucus. These symptoms may, however, be considered as appertaining more properly to the disease of the bronchi with which the emphysema is complicated, than to the emphysema itself.

When the emphysema is confined to one lung, or is much greater in one than in the other, the side most affected is perceptibly larger than the other, its intercostal spaces are wider, and it yields a clearer sound on percussion. If both sides are affected equally, the whole chest yields a very distinct sound, and, instead of its natural compressed shape, exhibits an almost round or globular outline, swelling out both before and behind: this conformation of the chest is sometimes so remarkable as to render the existence of the disease evident from simple inspection. (Laennec, Op. cit.)

The pathognomonic signs of this disease are furnished by a comparison of the indications furnished by percussion and auscultation; for while the sound elicited by percussing the chest over the part affected is perfectly clear, or even tympanitic, the respiratory murmur is extremely indistinct, or even completely extinct, and in its place a slight sibilous râle only is heard even during the forced inspirations that precede the act of coughing. These inspirations will be confirmed by the long continuance of the disorder, and the existence of an habitual dyspnœa, occasionally aggravated by asthmatic paroxysms.

When the disease is so far advanced as to form large vesicular cavities under the pleura, its presence may be recognised by a sound heard during inspiration or coughing, which is quite pathognomonic, and described by Laennec under the appropriate name of *the crepitous râle with large bubbles.* The sound of this râle he compares to that which would be produced by blowing into half-dried cellular membrane. We have repeatedly verified the accuracy of this comparison, and have uniformly found on dissection that the sound in question was produced either by an extreme state of vesicular emphysema, or by the interlobular form of the disease; we have often found these alterations on dissection in cases where this premonitory sound was never discovered.

There is another stethoscopic sound which Laennec describes as belonging exclusively to interlobular emphysema, but which we have heard on more than one occasion, in cases of vesicular emphysema, where the ruptured air-cells projected above the surface of the lung. We allude to the "*friction of ascent and descent,*" as Laennec terms it, which is a sensation of sound of one or more bodies rubbing against the ribs, and rising and falling during the alternate movements of inspiration and expiration. The friction of ascent takes place during inspiration, the friction of descent accompanies expiration, and is much more constantly audible than the other sound. Most commonly the friction seems to take place against the costal pleura; at other times it appears to have its site against the diaphragm or mediastinum, or between the lobes of the lungs. These sounds are sometimes accompanied by a crepitation perceptible to the hand.

Treatment. — As pulmonary emphysema must, in almost every instance, be regarded as an *accident* caused by some prior disease of the lung, the first indication should obviously be to remove the original disease, as the most effectual means of removing its effect, or, at least, of preventing its farther extension. This is perhaps as much as we can reasonably hope to accomplish in this case, as it is difficult to conceive how any method of treatment should restore that portion of lung which has once become emphysematous to its original healthy condition. M. Laennec, however, is of opinion that this affection should not be considered as altogether incurable; and that, if we can diminish the intensity of the cause which keeps up the habitual distension of the cells, we may in the end hope that these will be actually lessened in volume. With this view the cause of the emphysema should be combated by prompt and active treatment, and the patient should be made to abstain from all the ordinary exciting causes of dyspnœa, as they not only produce present distress, but likewise keep up the over-distension of the cells, and consequently increase the extent of the emphysema.

It has already been stated that emphysema in a moderate degree is not a disease of great severity, and it is from the supervention of attacks of asthma or bronchitis that the principal distress and danger are to be apprehended. Every precaution should therefore be adopted to remove these affections and prevent their recurrence.

To detail the treatment of these diseases here would be to repeat what has been stated in other parts of this work: we therefore refer the reader to the articles of ASTHMA, BRONCHITIS, and CA

TARRH, for all the information that can be obtained on the subject in the present state of our experience.

Laennec recommends frictions with oil as useful in diminishing the susceptibility to be affected with catarrh; but a more effectual method of accomplishing this object is by sponging the chest every morning with vinegar and water, and afterwards dry-rubbing the part with flannel or a flesh-brush, as recommended in ASTHMA. In the case of pallid cachectic patients, the subcarbonate of iron has occasionally seemed to have a similar effect, and to tend at the same time to diminish the congestion of the mucous membrane, and also the spasmodic stricture of the bronchi. It is also of importance to attend to the state of the digestive organs, as experience has fully proved that irritation of the bronchial membrane is very often a sympathetic affection depending upon irritation of the stomach. Whatever, therefore, is improper for a dyspeptic patient should be avoided by those who labour under emphysema of the lungs. Warm clothing in all cases of delicate mucous membranes is particularly necessary, and flannel should be worn next the skin during the day, the lower extremities should be kept especially warm, and other necessary precautions adopted to guard against the cold of the winter months. We have known many persons affected with emphysema of the lungs, and that to a very considerable extent, whose breathing was quite good during the summer months, but who dreaded the approach of winter as the never-failing harbinger of their sufferings. For such cases the only alternative is to spend the winter in a more congenial climate. Indeed there is, perhaps, no class of complaints in which the beneficial effects of change of air and climate are more decidedly manifested than in those chronic cases of pulmonary emphysema complicated with great susceptibility of irritation in the mucous membranes of the air-passages.—(See CLIMATE.)

II. INTERLOBULAR EMPHYSEMA.—This, as its name implies, consists in an effusion of air into the cellular tissue, which intersects the pulmonary parenchyma, and divides each lobe into a number of distinct lobules. This form of pulmonary emphysema may be easily recognised in the dead body, by the transparency of the interlobular partitions, which contrast strongly with the denser structure of the intervening portions of parenchyma. Instead of the scarcely perceptible thinness which they exhibit in the natural state, these partitions, in a state of emphysema, are distended to the breadth of two or three lines, or even of an inch in some cases. They are generally widest at the surface of the lung, where the distension of their delicate cells bears an apt resemblance to a string of glass beads. Sometimes the emphysema is confined to two or three interlobular partitions, which run parallel to each other from the margin of the lung; in some cases these parallel bands are intersected by transverse partitions likewise in a state of emphysema, and the lobules intercepted between these intersecting partitions are thus completely insulated, being surrounded on all sides by transparent cellular tissue in a state of emphysema.

When the disease continues to extend, the air passes from one interlobular partition to another, until it reaches the root of the lung, from whence it soon extends to the mediastinum, and thence spreads all over the cellular tissue of the trunk.—(See the preceding article.)

It sometimes happens in this form of the disease that the air escapes into the cellular tissue which connects the pleura to the lung: in this way one or more bubbles of air are formed immediately under the pleura, and may be pushed along the surface of the lung by the finger,—by which circumstance they may be distinguished from the vesicles that are formed in the true pulmonary emphysema, as the latter are prevented from being displaced in this way by their interlobular partitions.

The formation of interlobular emphysema is explained by M. Laennec as necessarily depending on a rupture of some of the air-cells, and the consequent extravasation of the air contained in them into the cellular substance surrounding the lobules. It must, however, be admitted that, even in the most extensive cases of this disease, no such rupture has ever been detected, and that the rupture of several cells constantly takes place, and yet not a particle of air finds its way into the interlobular partitions; nay, that these partitions may themselves be lacerated, and yet no interlobular emphysema be produced. Farther observations are required to elucidate this subject.

This form of emphysema is as rare as the other is common. It is very seldom combined with the true pulmonary emphysema; and in the great majority of cases seems to result from some sudden and violent effort of the respiratory muscles, as in the forcing pains of child-birth, in raising heavy weights, in hooping-cough, &c. Notwithstanding the greater density of their lungs, children appear to be more liable to this disease than adults. (Laennec.)

The only symptom from which the existence of this disease can be suspected, is the sudden supervention of dyspnœa after any violent effort of the lungs. Its stethoscopic signs are the dry crepitous râle with large bubbles, and the friction of ascent and descent already described. These sounds, it will be recollected, are likewise common to the vesicular form of emphysema when the pleura is projected by several air-cells thrown into one; perhaps the only method of distinguishing between these cases is by the *sudden* supervention of the dyspnœa and of the stethoscopic signs in the interlobular form of the disease: fortunately, however, the diagnosis is not a matter of much practical importance, as in the slighter cases (in which alone any ambiguity can exist) the air appears to be always absorbed, and the interlobular partitions gradually return to their natural state. When the aerial infiltration extends to the external parts, the difficulty of diagnosis is at once removed, and the disease may be treated on the principles already stated in the preceding article on general emphysema.

R. TOWNSEND.

EMPYEMA. 'Εμπύημα, formed of ἐν and πύον. literally signifies an internal collection of pus, and in this general sense was employed by several ancient authors. By subsequent writers its signification has been considerably restricted, and nosologists now apply the term exclusively to those collections of pus which are contained within the sac of the pleura. In practice, however, it is not always easy to determine, *à priori*, the precise nature of the fluid collected within the chest, as its physical characters are found to vary considerably, even in those cases that most closely resemble each other in their origin, progress, and symptoms. In a case of empyema of two months' standing, occasioned by the bursting of a tuberculous abscess of the lung into the pleura, the effusion, as observed by the writer, presented all the characters of genuine pus; while in another case, where the pleuritic effusion was produced by a similar cause, and assumed the same chronic form, the operation of paracentesis gave issue to a fluid as transparent and colourless as water. Other varieties, to be presently enumerated, have likewise been observed in the appearance and composition of these fluids; and as there are no peculiar symptoms by which we can always discriminate their precise nature during the lifetime of the individual, the term is now generally used without any reference to the puriform character of the effusion.

When effusion into the thorax takes place in an individual of a dropsical diathesis, and seems to result from an obstruction to the circulation and the consequent transudation of the serous part of the blood, rather than from any irritation of the secreting surface, the disease is denominated *hydrothorax*. When the effusion is known to consist of blood, as in penetrating wounds of the chest, where the pulmonary or intercostal vessels have been injured, the term *hæmothorax* is used to express it; and the name of *pneumothorax* is applied when the effusion is of a gaseous nature. With these exceptions, all cases of effusion into the pleura that are sufficient to compress the lung and impede the function of respiration, are comprehended under the generic appellation of *empyema.*

The pleura, like other serous membranes, constantly exhales a fluid in the form of vapour, by which its surface is lubricated and moistened. In the natural state, this perspiratory fluid always exists in the form of halitus or vapour; but in a morbid state, it is sometimes exhaled in much larger quantities, and instead of vapour assumes the fluid form. Its qualities are then also materially altered, so that, instead of a slight moisture barely sufficient to facilitate the gliding motion of the opposing surfaces on each other, the serous sac is filled with certain morbid secretions, of which the following are the principal:—

1. Serum: its composition is sometimes the same as that of the blood, and sometimes differs from it in containing a greater or less proportion of albumen.
2. The same combined with a certain quantity of the colouring matter of the blood.
3. Pure blood.
4. Pus.
5. The spontaneously coagulable and organizable matter of which false membranes are formed, and which, in their turn, are liable to undergo various morbid alterations: thus they may become inflamed and form new false membranes, or exhale blood, or secrete pus, melanosis, or tubercle; or lastly they may be transformed into fibrous, cartilaginous, or osseous tissue. (*Andral,* Anatomie Pathologique.)

These morbid productions, either singly or variously combined, form the principal, if not the only ingredients in all cases of pleuritic effusion.

Our knowledge of the pathology of pleuritic diseases in general, and of empyema in particular, has been considerably advanced of late years by the labours of Laennec, Broussais, and Andral, whose works, (*Traité d'Auscultation Médiate, Histoire des Phlegmasies Chroniques, Clinique Médicale,*) contain the most complete history we possess of these diseases, and may indeed be said to form a new era in the pathology of this class of affections.

The effusion of empyema, it is now generally admitted, is in all cases principally, if not entirely, formed by a morbid secretion from the pleura, and may in almost every instance be referred to inflammation of that membrane, either in an acute or chronic, an evident or latent form; and even in those cases where pus or other matter is introduced into the pleura from an extrinsic source, as from the rupture of a pulmonary or hepatic abscess, the collection of fluid which constitutes the empyema consequent thereon, does not consist so much of the matter of the abscess as of the morbid secretion from the pleura, which the irritation caused by the presence of that matter produces.

The nature of the exudation in acute pleuritis and the successive stages of its organization and conversion into false membrane, are detailed in a separate article in this work. (See PLEURITIS.) For our present purpose, it is only necessary to consider those morbid secretions of the pleura which evince no disposition to become organized or absorbed, but continue to accumulate in the shut sac of that membrane, where they act as a foreign body, and, by their pressure on the important organs contained within the parietes of the chest, present a constant obstacle to the due performance of their functions.

In some cases the effusion consists of a clear, transparent, or lemon-coloured serum; sometimes the effused fluid, though it still retains its transparency, contains several flocculi of albumen, some suspended and others precipitated to the bottom. More frequently it is rendered quite turbid by the quantity of these minute flocculi that are partially dissolved and suspended in it, while the pleura, more especially the most dependent portion of it, is covered with an inorganic layer of a white or yellowish paste formed by these flocculi, which fall in the form of the sediment to the bottom of the fluid in which they were suspended. In other cases, and they are by far the most numerous, the effusion is still more turbid, and of a greyish brown or yellow colour—in short, it exhibits every intermediate variety of appearance until it presents all the characters of genuine pus.

These different varieties of effusion are sometimes mixed up with the contents of abscesses formed in the neighbouring parts, as in the lungs or liver, and discharged into the pleura. In some cases the effusion is coloured by the admixture of a certain quantity of blood, and in some rare instances the effusion has been found to consist entirely of blood. This sanguinolent effusion sometimes occurs at the very onset of the pleuritic attack, constituting the *primitive hemorrhagic pleurisy* of M. Laennec, but is more frequently observed to occur at a more advanced stage of pleurisy, particularly at the time when vessels begin to be formed in the false membranes, or when a fresh attack of inflammation supervenes in them. Much importance was attached by the old writers to the decomposition of these effusions and their tendency to putrescency; but the best pathologists are now agreed that they never acquire an offensive odour, or exhibit any sign of decomposition unless when the parietes which enclose them become gangrenous, or when a communication has been established between the fluid and the external atmosphere. (*Andral* and *Broussais*, Op. cit.)

The quantity of these effusions is sometimes so very great as to compress the lung into the smallest possible compass, and exhaust it of its air more effectually than could be done after death by means of an air-pump; at the same time the parietes of the chest which are in any degree susceptible of motion are distended to the utmost; the ribs are elevated, and their lower margins everted, so as to increase their capacity as much as possible; the intercostal spaces are protruded; the diaphragm is forced down into the abdomen, and the abdominal viscera are consequently displaced, especially the liver, which, in cases of extensive empyema of the right side, has been known to descend into the iliac fossa. (*Stoll*, Ratio Medendi.) The mediastinum, in like manner, yields to the distending force of the effused fluid, compresses the opposite lung, and allows the heart to be thrust completely out of its natural situation. We shall presently see that this displacement of the heart is one of the most constant and least fallible symptoms of empyema. Without this great enlargement of the affected side, it would be physically impossible that one sac of the pleura could accommodate such an enormous quantity of fluid as has occasionally been found there.

A patient of Dr. Croker, of Dublin, was lately operated on for empyema by Mr. Crampton, when the almost incredible quantity of fourteen imperial pints of pus was drawn off from the left pleura. In Dr. Archer's case of successful paracentesis of the thorax, recorded in the second volume of the Transactions of the Dublin Association, eleven pints of an inodorous fluid were drawn off, and in a few weeks after the patient was quite convalescent. Many other instances might be quoted of effusions equally great, or even still more extensive.

When the effusion is removed, it seldom happens that the pleura is exposed to view, as its surface is almost invariably covered with a coating of adventitious matter, which gives the interior of the chest much more the appearance of the walls of a large abscess than of a cavity lined with serous membrane. When, as in cases of latent pleurisy, the pleura is covered with a layer of the inorganic sediment, which is deposited when the effusion is wholly puriform, the layer of matter may be scraped off with the handle of the scalpel, and then the membrane underneath presents an opaque blueish appearance, as if caused by the maceration to which it had been so long submitted. A few red dots or striæ, as if laid on with a pencil, are generally dispersed over its surface; the membrane itself is seldom if ever really thickened, its apparent thickening being in almost every instance caused by a coating of adventitious membrane, which had been exuded during the earlier stages of inflammation. When the chronic pleurisy succeeds to an acute attack, this apparent thickening of the pleura is a very constant appearance: sometimes the adventitious membrane forms a delicate transparent pellicle, which appears perfectly incorporated with the subjacent membrane, but may, however, be dissected from it in one or more layers; sometimes the pleura is closely studded with minute transparent or opaque granulations of a flattened form, but most frequently the adventitious coating is of an opaque whitish colour, and varies in consistence from curd or soft cheese to fibro-cartilage, to which substances it often bears a very strong resemblance; and as it is generally composed of several strata laid one over the other, it sometimes forms a dense solid layer many lines or even inches in thickness. When a coating of this description is developed on the pulmonary pleura, it forms such an unyielding envelope round the lung in its compressed, contracted state, as must effectually prevent its expansion when the pressure of the fluid is removed; and as the lung in this condition cannot dilate itself promptly enough to keep pace with the progress of absorption, when the disease terminates favourably, the parietes of the chest must necessarily fall in to occupy the space left by the removal of the fluid: in this way is produced the *contraction of the chest* which so constantly follows the removal of a chronic effusion from the pleura either by absorption or evacuation.

The adventitious membranes which line the pleura are liable to a variety of morbid alterations; they are evidently susceptible of inflammation, and likewise of ulceration; for in many cases they have been observed eroded, as it were, with small circular pits, sometimes shallow and sometimes penetrating through the whole thickness of the false membrane: occasionally these penetrating pits communicate with each other by sinuses, or by a more extensive separation of the false membrane from the subjacent pleura, but at other times the ulceration penetrates through the pleura itself. When this happens on the costal pleura, it sometimes gives rise to the formation of external tumours, which either burst externally and discharge the matter of the empyema, or else form one or more sinuous passages by which the pus is infiltrated into the subcutaneous and intermuscular cellular tissue; but when it takes place in the pulmonary pleura, a communication is eventually formed with a bronchial tube, through which (according to the position of the body at the time) part of the fluid escapes, or air enters. Several cases illustrative of these morbid appearances are recorded in Dr. Duncan's interesting essay on empyema and pneumothorax, in the 28th volume of the Edinburgh Medical Journal. The pleura and its adventitious coating of false membranes is likewise subject to gangrene, and the detachment of the gangrenous eschars sometimes serves, as in the case of simple erosion just noticed, to form an outlet by which the matter of the empyema is evacuated.

These false membranes are likewise liable to other morbid changes. Sometimes they are transformed into fibrous or cartilaginous tissue, and in some instances they have been found completely ossified; they are also liable to the development of various morbid productions, particularly tubercle. The tubercles that are formed in false membranes are generally small and very numerous. We have, however, once or twice seen tubercles as large as filberts in the adventitious coating of the pleura; their development is usually a slow process, and generally occurs in cases of very chronic pleuritis; but sometimes they are generated in great numbers with an extraordinary rapidity. M. Andral has seen the false membranes studded with tubercles in persons who died of acute pleuritis of only fifteen days' standing. (Clinique Medicale, vol. ii.)

The morbid alterations which we have described may exist in both sacs of the pleura at the same time, constituting the double empyema of authors, or, as much more commonly happens, may occupy one side of the chest; or, lastly, may be limited to a part of one side. When the inflammation is limited to a certain extent of the pleura, the effusion is generally circumscribed by adhesions which prevent its creeping into the general sac of the pleura; these circumscribed empyemas, as they are termed, may exist between the lower lobe of the lung and the diaphragm, or between two contiguous lobes, between the inner surface of the lung and the mediastinum, or between any part of its outer surface and the costal pleura. Not unfrequently there exist between the pleura costalis and pulmonalis a number of dense firm adhesions, which, like so many shelves or partitions, intersect the effusion, and divide the sac of the pleura into a number of distinct compartments. We examined the body of a patient who died of empyema in the Whitworth Hospital, in March 1830, in whom the effusion was divided by these partitions into three compartments, so perfectly distinct from each other, that had the operation of paracentesis been performed during life, that compartment only could have been evacuated into which the incision had been made; so that in order to draw off the entire effusion, it would have been necessary to perform three several operations.

The effect of the effusion in compressing the lung and diminishing its volume, has already been alluded to. When the effusion is very extensive, the lung becomes flattened and completely flaccid, and its surface corrugated like the shrivelled rind of a withered apple; in this state the pulmonary tissue is soft, pliant and dense, like a piece of skin, without any crepitation, more pale than natural, and entirely without blood; its blood-vessels are flattened and frequently appear quite empty. (*Laennec*, Op. cit.) The lung thus circumstanced is incapable of expanding for the admission of air so long as the fluid continues to press on its surface; its alveolar texture, however, continues very distinct; and, when its surface is not coated with an unyielding false membrane, it may be readily restored to its full dimensions by inflation. The usual position which the lung thus compressed occupies, is by the side of the spinal column, against which it sometimes lies so close as to have escaped the observation of several distinguished anatomists, who accordingly described it as totally destroyed by suppuration. Its position may, however, be materially altered by adhesions attaching it to different points of the thoracic parietes, and preventing its receding from them. We have known the lung retained in close contact with the whole anterior part of the chest, while the fluid was accumulated in the posterior part. Andral records a case of empyema, in which the upper and middle lobe of the right lung were retained in their natural position by adhesions, and formed a complete roof over the effusion, which filled the whole of the lower part of the chest. (Clinique Medicale, vol. ii.) Drs. Graves and Stokes relate two remarkable cases of empyema in the fifth volume of the Dublin Hospital Reports, in both of which the lungs were attached from their apex to their basis by a vertical adhesion of about two inches in breadth. Other observations might be adduced illustrative of the effects of adhesions in preventing the lungs receding from the parietes of the thorax; but for our present purpose it is sufficient to remark that, as there is no part of the pulmonary pleura which may not contract adhesions with the corresponding surface of the costal pleura, so there is no part of the chest with which the lung may not be retained in contact, even in cases of very copious effusion. The knowledge of this anatomical fact is, as we shall presently see, of considerable importance in some cases for determining the presence of empyema, and likewise for selecting the site of the operation of paracentesis.

The lung, when compressed in the manner we have described in the preceding paragraph, is seldom attacked with inflammation; indeed its exsanguineous condition would seem to guarantee it sufficiently from attacks of that nature; but there is another morbid alteration which the lung under such circumstances frequently presents, namely, the development of tubercles. M. Broussais supposes that their formation is in most cases consequent to the effusion, and in a great degree, if not altogether, produced by the obstruction of the lympathic circulation in the part. (Op. cit. vol. i. p. 343.) A more general opinion however is, that tubercles are in this, as in other cases, the result of a general diathesis, and had probably existed in the lung before the effusion had taken place. M. Broussais's opinion, if correct, would furnish a strong argument in favour of operating at an early period of the effusion, in order to anticipate, if possible, the formation of the tubercles. Another morbid appearance which the lung occasionally presents is the formation of a gangrenous or phlegmonous abscess, by which, when the pleura is perforated, the effused fluid finds a passage into the bronchi, and is expectorated.

Such are the principal morbid appearances that have been observed after death in cases of empyema: it now remains for us to investigate the causes of these anatomical lesions, and to consider the symptoms to which they give rise, and by which they may be distinguished during life. We shall thus be prepared to form a correct estimate of the progress and termination of this disease, and of the remedies best calculated to arrest its progress and remove its effects.

We have already seen that the matter of empyema is in most cases formed exclusively by a morbid secretion from the pleura, and that, even in those instances where pus or other matter is introduced into the pleura from the rupture of an adjacent abscess, the empyema which follows is principally formed by exhalation from the inflamed pleura. It may, therefore, be assumed that inflammation of the pleura is the proximate cause of empyema. As, however, the ordinary course of pleuritic inflammation is not to terminate in empyema, but in the exudation of a compound fluid, the serous portion of which is subsequently absorbed, and the solid part organized and converted into false membrane, it becomes a question to determine what are the circumstances that cause the inflamed pleura to secrete the inorganic matter of empyema rather than the ordinary organizable product of pleurisy, or, in other words, what are the species of pleuritic inflammation which have the greatest tendency to terminate in empyema.

These may be divided into four classes:

1. Acute pleuritis of intense violence.
2. Acute pleuritis degenerating into the chronic form.
3. Inflammation of the pleura of so low a type as not to present the ordinary symptoms of acute pleurisy.
4. Pleuritis caused by the introduction of foreign substances.

1. *Acute pleuritis of intense violence.*—It very rarely happens that inflammation of the pleura is so intensely violent as to induce gangrene. When it does occur, a copious effusion always follows. More frequently, when the pain and other inflammatory symptoms present an unusual degree of violence, blood is effused from the inflamed surface; generally speaking, the effusion of fluid is more abundant in the hemorrhagic than in the simple pleurisy, and the tendency to absorption is much less. (*Laennec*, Op. cit. Dr. Forbes's Translation.) Lastly, when the pleuritis assumes this violent intractable character, a copious secretion of puriform matter may take place at an early stage of the disease. In a young woman who died in the Hardwicke Fever Hospital in the year 1826, after experiencing for twelve days before her death the symptoms of most violent inflammation of the pleura, we found, on dissection, nine pints of thick inodorous pus in the right pleural sac. M. Andral records another case in which a purulent effusion was formed with equal rapidity. Although the inflammatory symptoms were combated from the very outset of the disease by the most active treatment, on the fifth day the whole of the right side sounded dull on percussion, and respiration had ceased to be audible there; on the seventh, the side was evidently dilated; and on the eleventh, when the disease terminated fatally, the right side was found, on dissection, so filled with pus that the lung was completely condensed and flattened against the spine. (Clinique Médicale, vol. ii. case 13.) Piso likewise relates several cases of acute pleuritis, in which the patients died on the fifteenth, and some even so early as the ninth day, *with their sides full of pus.* (De Affect. a Seros. Colluv. ortis, sect. iii. cap. ix.) In those acute cases of empyema, the diagnosis is never difficult; the extreme violence of the symptoms, the acute pain of the side rendered almost insupportable by coughing, the excessive dyspnœa, general anxiety, and high fever, at once point out the highly inflamed state of the pleura, and awaken our attention to the possibility of its terminating by effusion: when under such circumstances the physical signs of effusion (to be presently described) rapidly supervene, the existence of empyema is placed beyond a doubt. This acute form of empyema is, however, much more rare than those chronic forms of the disease we are next to consider.

2. *Acute Pleuritis degenerating into the chronic form.*—In the greater number of pleurisies which terminate favourably, the process of the absorption and organization of the effusion is completed within a limited period, which, at an average calculation, may be estimated at three weeks or thereabout. (*Broussais*, Op. cit.) Whenever the symptoms of pleuritic inflammation outlast this period, or when, after a temporary abatement of the inflammatory symptoms, the patient is seized with rigors and irregular febrile paroxysms similar to those of remittent fever, there is reason to fear that the disease is about to assume the chronic form, and empyema may be apprehended. In many cases the passage of the disease from the acute into the chronic form may be traced to the circumstance of its having been neglected during its earlier stages, or not combated by sufficiently active treatment, or else to some indiscretion on the part of the patient during convalescence, particularly in the article of diet; but we likewise meet occasionally with cases of acute pleurisy, which, however actively and judiciously treated, inevitably degenerate into the chronic form. M. Broussais, whose opportunities of observation in this matter have been most extensive, states, as the result of his experience, that acute pleurisy passing into the chronic form is decidedly the most frequent cause of empyema. Whenever, therefore, the symptoms of pleuritic inflammation outlast their ordinary period, and are succeeded by those of effusion, we have the strongest evidence of the existence of empyema, inasmuch as the symptoms of empyema made their appearance under those circumstances which most frequently lead to such a termination.

3. *Inflammation of the Pleura of so low a type as not to present the ordinary symptoms of Acute Pleurisy.*—Several physicians of the last century, and particularly Stoll, had remarked that, in many cases of pleurisy, the stitch which commonly attracts attention to the character of the disease, is altogether wanting, and that the insidious mildness of the whole symptoms in the early stage is such as not even to excite any suspicion of a severe affection. This latent form of pleurisy is essentially chronic in its progress. At no period of its course does it present the intense fever, severe pain, or energetic re-action, which characterize an acute disease. It seldom occurs in persons of good constitution, but usually attacks those who have become cachectic from some cause or other, especially persons of a strumous habit. (*Laennec*, op. cit. Dr. Forbes's translation.) There are, however, certain exciting causes, which are said to have a peculiar tendency to generate this latent form of pleurisy, amongst which may be enumerated contusions of the chest, wounds of

the pleura, the cold stage of ague, and metastasis of rheumatism. These causes, says M. Broussais, (op. cit.) most commonly give rise to pleurisies that are latent in their origin and chronic in their progress. Effusion of puriform matter may likewise take place into the pleura from other causes, and without being preceded by the ordinary symptoms of pleuritic inflammation. A case of latent empyema, consequent on venous inflammation, lately occurred in the Meath Hospital, under the care of Mr. Porter. The patient, a stout young man, in the course of a few days, after having been bled, was seized with symptoms of phlebitis, and diffuse inflammation of the cellular membrane extending along the arm to the axilla. The disease proved fatal, and on dissection, in addition to the morbid appearances of the diseased limb, the pleura of the same side was found to contain several quarts of pus. In this case, no symptom whatever was observed during life to excite any suspicion of the pleura being the seat of disease. We have also known the amputation for white swelling followed in two instances by copious depositions of pus in the pleura, and in neither case was there any symptom to indicate disease of that membrane. Several similar cases have appeared lately in the French journals of severe operations, especially those for the removal of suppurating parts, being followed by extensive depositions of pus in the interior, and on the surface of different organs.* In these and similar cases, it is probable that the depositions of pus are formed independently of any inflammatory process in the tissue where they are collected, or, to use the expression of M. Andral, "that the pus is first taken into the circulation, and subsequently separated from the circulating fluid, just as mercury, when injected into a vein, is found to deposit its globules in different parts of the body." (Andral's Pathological Anatomy, vol. i. p. 503.)

Whatever the cause of the latent character of the disease may be, experience has fully proved that in a considerable proportion of the deaths from empyema, no symptom of pleuritic disease has been observed until the effusion was fully formed; for which reason the diagnosis of this form of empyema is often very obscure.

4. *Pleuritis caused by the introduction of foreign substances.*—Foreign bodies may be introduced into the pleura either through the lung or through the parietes of the chest. Amongst the former may be enumerated the contents of tuberculous, pneumonic, or gangrenous abscesses, or of pulmonary apoplexy bursting through the pleura. Of these the rupture of a tuberculous abscess is beyond all comparison the most frequent in its occurrence. Within the last four years no fewer than eighteen cases of empyema, with pneumothorax from this source, have come under our own observation, fifteen of which were verified on dissection, and we have heard of several other cases occurring in the hospitals of Dublin. The rupture of a pneumonic abscess was supposed, by the older anatomists, to be the most prolific source of empyema; but the researches of modern pathologists have ascertained that the formation of a pneumonic abscess is in itself an exceedingly rare occurrence, and its bursting into the pleura an event still more rare. The rupture of a gangrenous abscess, though of somewhat more frequent occurrence, must nevertheless be considered as an extremely rare cause of empyema. M. Laennec records a case of pleurisy and pneumothorax consequent to the discharge of a gangrenous abscess of the lungs, (Case 15, Op. cit.); and he alludes to another case in which a gangrenous eschar made its way into the pleura, determining a pleurisy which lasted fifteen months. (Op. cit. 227.) Andral likewise relates a case of pleuritic effusion produced by the bursting of a gangrenous abscess. (Op. cit. vol. ii. p. 433.) More commonly, however, the gangrenous affection proves fatal before sufficient time has been allowed for the formation of empyema. In all these cases, the rupture of the lung and its investing membrane not only pours into the pleural sac the contents of the abscess, but likewise allows the air to enter at each inspiration, (see PNEUMOTHORAX;) and this elastic fluid, by compressing the lung at the same time that it irritates the pleura, produces an effusion which seldom terminates in adhesion, as the lung is, by the surrounding stratum of air, compressed against the spine, and thus prevented from coming in contact with the parietes of the chest. The bursting of pulmonary apoplexy into the pleura has, we believe, only been known to occur in four cases, and in each of these the accident was instantaneously fatal. (See PULMONARY APOPLEXY.)

Various substances may likewise find their way into the pleura through the parietes of the chest, and by their presence give rise to empyema. Abscesses of the liver have been known to burst through the diaphragm into the pleura. A case of the kind is recorded by Morgagni, (Epist. xxiv. No. 4.) and another example of this morbid lesion is detailed in the Journal de Médecine. (Tom. iii. p. 47.) These may, however, be regarded as very rare cases; for when an hepatic abscess takes this direction, the inflammation which precedes its progress generally produces an adhesion between the lung and diaphragm, which prevents the escape of the matter into the pleura, and directs it into the interior of the lung, from whence it may be expectorated through the bronchi: two specimens, exhibiting this course taken by abscesses of the liver, are preserved in the museum of the Whitworth Hospital. Abscesses formed in the walls of the chest may likewise burst into the pleura, though, like those of the liver, they more frequently open directly into the lung, or point externally, and suppurate on the surface. But in order to obviate the risk of their breaking internally, the safest plan is to make an early opening and let out their contents. The importance of this practical rule is well illustrated in an interesting case related by Dr. Duncan, in the first volume of the Medico-Chirurgical Transactions of Edinburgh, in which the disease having commenced by the formation of an abscess in the parietes of the chest, and no external opening having been made, the pus eroded the pleura costalis, entered the cavity, excited chronic pleuritis, and at last found an exit through the lungs by a bronchial tube, establishing a communication between the aërial passages and the external tumour. Other remarkable examples of the danger of allowing these abscesses to burst internally are recorded by Sabatier, (Médecine Opératoire, tom. ii. p. 124,) and by De Haen, in his Ratio Medendi. Hemorrhage into the thorax from wounded vessels is not unfrequently followed by empyema, and extraneous substances introduced through penetrating wounds of the chest, such as spiculæ of bone, bullets, pieces of wadding, clothes, &c., by their presence in the pleura give rise to inflammation, which sometimes terminates in empyema, but more frequently in the exudation of organizable matter, which forms an investment round the foreign substance, and limits its effects to the spot where it is immediately situated.*

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* See Recherches sur certaines Altérations qui se développent à la suite des blessures ou des opérations, par M. Marechal, in 4to. 1828.

Such are the principal lesions that usually precede the formation of empyema. We would here observe that a knowledge of the antecedent disease and of the symptoms preceding the effusion is often as essential towards forming a correct diagnosis of empyema as a knowledge of those symptoms which denote that the effusion has actually taken place, since the distinctive characters of the affection are often more strongly marked during its earlier stages than at its termination. Thus it frequently happens that a patient presents a train of symptoms which may be referred either to hepatization of the lung or effusion into the pleura; and so closely do the symptoms and physical signs of those affections resemble each other, that it is frequently impossible to distinguish between them so long as we confine our attention to the symptoms actually present; but if, on referring to the preceding history of the case, we find that the present symptoms were preceded by those of acute pleurisy subsequently degenerating into the chronic form, the difficulty of diagnosis is at once removed: unfortunately, however, the symptoms which precede effusion are in some cases as obscure as those which attend its actual formation, and hence arises the principal difficulty in detecting the presence of empyema.

Diagnosis.—The diagnosis of empyema has been most materially improved of late years. Laennec's happy application of the principles of mediate auscultation to the diagnosis of thoracic diseases has added a new and valuable set of physical signs to the symptoms of this disease previously known; and the researches of modern pathologists, by reducing those symptoms to their precise signification, and assigning to each its just value as a distinctive character, have rendered the diagnosis of empyema as remarkable for accuracy and precision as it formerly was for error and obscurity.

Of the symptoms hitherto enumerated by nosologists as characteristic of this disease, such as "fixed pain in the chest, breathing laborious, but easiest in the erect position, difficult decumbiture on the sound side, fluctuating enlargement of the side affected, and dry tickling cough," (Good's Study of Medicine, vol. ii. p. 264,) almost all are common to it with other affections, and even of these equivocal symptoms the greater number are frequently wanting. Under such circumstances it is scarcely to be wondered at if the disease was constantly mistaken, or its very existence overlooked, of which so many examples are recorded in medical literature, that the only difficulty lies in the selection.

From a survey of the recorded cases of empyema, and from our own observation, it is evident that, as empyema may exist without its characteristic symptoms, so these symptoms may exist without empyema; of which fact, indeed, the annals of surgery furnish but too convincing proofs in the numerous cases where the operation for empyema has been performed, but where no empyema existed. A remarkable case of this kind is recorded by M. Baffos, in his inaugural dissertation, *sur l'Empyème*, printed in Paris in 1814. A patient in one of the principal hospitals of that city presented a combination of symptoms which was supposed to demonstrate so unequivocally the presence of empyema that the operation of paracentesis was performed, but to the surprise of the operator no fluid was found; however, as the existence of empyema seemed indisputable, it was resolved in consultation to make an incision into the pleura of the opposite side; the second operation was attended with no better success than the first—not a drop of fluid followed the incision into either pleura. Dionis relates a similar occurrence in the case of the Duke de Montemart, who was operated on for empyema, which he had not; and he mentions another case in which a similar mistake cost the patient his life. (Dict. des Sciences Médicales, art. *Empyème*.) Willis likewise notices the occurrence of such mistakes: "Novi enim (says he) in aliquibus thoracis paracentesin et frustra et non prorsus innoxie celebratam fuisse." (Opera omnia; de *Empyemate*.)

These examples may serve to show the uncertainty which formerly prevailed in the diagnosis of empyema, and the fatal results which too often followed these errors of diagnosis; it is needless to make any additional observations to point out the great practical importance of the improvements which have lately been made in this department of medical science, by which we are now enabled to detect the existence of this disease in every case where its diagnosis is a matter of practical utility.

The following symptoms and physical signs are those most characteristic of empyema, and when they are all combined, may be considered as quite pathognomonic:—Difficult respiration, increased by motion or exertion of any kind, and considerably aggravated by lying on the sound side; a sense of fulness and oppression in the chest, amounting in some cases to a sense of suffocation; enlargement of the diseased side; protrusion of the intercostal spaces, with obscure sense of fluctuation and œdema of the integuments; dulness of sound on percussion, and absence of the respiratory murmur in the diseased side, which remains perfectly motionless; puerile respiration in the opposite lung, accompanied with violent action of the respiratory muscles; displacement of the heart; descent of the diaphragm and consequent protrusion of the abdomen: to these characteristic marks may be added harassing short cough, small, rapid pulse, flushed cheeks, and other symptoms of hectic fever.

From this combination of symptoms, especially when they have been preceded by those of inflammation of the pleura, the existence of empyema may be certainly inferred. It is, however, to be remarked, that several of these symptoms vary considerably, according to the extent of the effusion, and even in those cases where the quantity of effusion is the same, according to the date of its formation. Thus, when the effusion is rapidly formed, the difficulty of breathing is extreme, the accompanying fever intensely violent, and the anxiety and dread of suffocation urgent and unceasing; but as the disease continues, these symptoms often assume more of a chronic character; the dyspnœa gradually diminishes, and is perhaps only perceptible after exercise or taking food; the fever likewise disappears, or is only perceptible towards evening; and the patient, encouraged by this abatement of the symptoms, complains only of weakness, and anticipates the speedy restoration of his health and strength. But if the physical signs of the disease be had recourse to, it will be found that this alleviation of symptoms is altogether illusory, and that the disease, instead of receding, has been steadily advancing.

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* See on this subject, Hennen's Military Surgery, and Baron Larrey's Mémoires.

As, then, the most characteristic symptoms of this disease are liable to considerable modification, and as several of them are occasionally wanting altogether, it may be worth while to examine each symptom separately, to consider how it is produced, what it signifies, and what is the precise relation it bears to the disease. We shall thus understand the just value of each, and see how far the existence of empyema is proved in the affirmative by its presence, or in the negative by its absence; for, as it is impossible to describe every variety of combination which the symptoms of empyema may present, the only alternative is to enable the physician, by acquainting him with the precise import of each symptom individually, to form his opinion of their signification collectively in whatever form of combination they may present themselves.

1. *Dyspnœa.*—The difficulty of breathing experienced in this disease is generally proportionate to the degree of pressure which the lung sustains, or, in other words, to the quantity of the effusion. To this general rule there are, however, numerous exceptions; indeed there is scarcely an author who has treated of this disease that does not recount instances of patients labouring under such extensive effusion as to compress the greater portion of one or even of both lungs, whose respiration was nevertheless not in the least affected. (See, for example, *Frank*, de Curand. Hom. Morb. t. viii. p. 232; *Duncan*, Edin. Journ. loc. cit.; *Andral*, Op. cit. p. 240.) We must, however, suppose that the aeration of the blood is as perfectly accomplished in those cases as when both lungs are in the free exercise of their functions, for experience has shown that sooner or later these patients lose their flesh and strength, and their lives eventually fall a sacrifice to the disease. Experience has shown that the difficulty of breathing is extremely urgent when the empyema is formed rapidly, but that in more chronic cases the dyspnœa is generally proportionate to the violence of the fever, and the quantity of the effusion. Some individuals, however, have their breathing much more easily affected than others, and accordingly, under apparently similar circumstances, the dyspnœa continues extremely urgent in some from the commencement of the disease to its termination; in others, the respiration is at first greatly affected, but the dyspnœa gradually diminishes, and recurs only at intervals when the circulation is excited; whilst in a third set, the respiration continues apparently unimpeded from the beginning to the end of the disease. (*Andral*, Op. cit.) For these reasons, and as, moreover, the symptom of dyspnœa is common to almost every affection of the lungs, it can only be used in the diagnosis of empyema as corroborative of other less equivocal symptoms.

2. *Decumbency.*—The difficulty which patients affected with empyema experience from lying on the sound side has been noticed by all writers on the subject since the time of Hippocrates. The cause of this symptom, which by many is considered as quite pathognomonic, has been differently explained by authors. Le Dran ascribes the sense of suffocation, produced by turning on the side opposite to that in which the collection of pus is situated, to the mediastinum being on a sudden loaded with an unusual weight of fluid. (Observations on Surgery, p. iii., edit. 2.)

M. Richerand, on the other hand, made several experiments, by producing artificial hydrothorax, to prove that fluid contained in one side of the chest, could not, by its gravitation, displace the mediastinum, or exert any pressure on the organs contained in the opposite side, and hence argued that the difficulty of lying on the sound side arises not from the pressure of the incumbent fluids, but from the obstruction to the dilatation of the sound side, produced by placing it under the weight of the body.

In opposition, however, to this ingenious reasoning, we have direct proof of the influence of the weight of the fluid; for we find that in cases of pneumothorax with empyema the patient can generally lie on the sound side so long as the effusion is principally gaseous; but as the proportion of ponderable fluid increases, decumbiture on the sound side becomes impossible. In like manner, in cases of empyema the dyspnœa is in general greatly aggravated by lying on the sound side; but when the fluid is evacuated, the patient is immediately enabled to turn on the sound side, although the necessity for its free dilatation continues as great as before—the disease being still in a state of perfect inaction. In the case of pneumothorax with empyema, related in the fifth volume of the Dublin Transactions, in which the operation of paracentesis was performed, the patient was enabled to lie on the sound side the night after the fluid was drawn off, though it was ascertained by auscultation that the side was then filled with air, and the necessity for the free dilatation of the sound side consequently as great as before the operation.

These observations render it probable that the difficulty of lying on the sound side arises from the load which is thereby thrown on the mediastinum, as well as from the obstruction which the muscles of inspiration experience when the side which they have to dilate is placed under the weight of the body. To avoid this inconvenience, patients labouring under effusion into the chest generally lie on the diseased side, or else on the back, with a slight inclination of the body towards that side. This latter position is the more general of the two, and is so very characteristic as to lead in some cases to a suspicion of the disease even before any farther examination has been made. This position, however, is not so constantly observed but that we meet with frequent deviations from it. When the fever has completely subsided, and the thoracic viscera have become habituated to the pressure of the effusion, the patient can sometimes lie indifferently on his back or on either side; and there are even some cases on record where the patient lay constantly on the sound side. J. F. Isenflamm relates a remarkable case of this kind, in which a patient presenting all the usual symptoms of empyema, lay generally on the right side, which for this reason was supposed to be the seat of the disease. Accordingly the operation was performed, but no pus was found. The patient died, and on dissection it was discovered that the left side was the seat of the empyema. (Versuche einer praktischen Abhandlung neber die Knochen. Erlangen, 1782.) Morgagni relates a case of this kind on the authority of Valsalva, and M. Baffos (Op. cit.) records another instance. These, however, may be considered as exceptions to a general rule, and probably depend on some adhesions which confine the effusion, and prevent its gravitating to the most dependent part of the chest.

When the empyema is double, the patient can seldom lie in the horizontal position, but remains constantly seated with his body inclined forward. (*Andral*, Op. cit.)

3. *Dilatation of the side.*—When we strip a patient affected with empyema, and examine his chest, we generally perceive a marked difference in the size and shape of the two sides; that into which the effusion has taken place appears considerably larger; and this difference, which is most evident posteriorly, is rendered still more remarkable by the altered position of the ribs, which continue fixed immovably in the position they naturally occupy during full inspiration, and contrast strongly with the increased motion of the ribs of the opposite side. The intercostal spaces are also remarkably wide, and in some cases, especially in thin persons, project beyond the level of the ribs: this latter sign is of considerable importance, as it serves to distinguish empyema from hepatization of the lung or enlargement of the liver.

The increased size of the diseased side is in general very perceptible to the eye when it amounts to five or six lines: it seldom exceeds an inch and a half; but in Dr. Croker's case, already alluded to as having had seven imperial quarts of pus drawn off at one time, the difference amounted to three inches and a half. The most accurate way of ascertaining whether any and how much dilatation exists, is by measuring both sides with a tape carried from a central point in the sternum under the mamma to the spinous process of the corresponding vertebra. The xiphoid cartilage frequently deviates from the median line, and is therefore an improper point to measure from: it may be also well to observe that the right side of the chest is generally some lines larger than the left, probably from the greater development of the pectoral muscles of that side. Another cause which might lead to erroneous conclusions from the measurement of the thorax is, that in those cases of empyema where absorption takes place to a certain extent, the parietes of the chest fall in as the effusion is removed: in this way the diseased side comes to measure less than the other; and if the thorax were measured for the first time under those circumstances, the sound side would appear comparatively dilated, and might be mistaken for the seat of the disease. This error would, however, be at once rectified on applying the stethoscope. In deformed persons it is impossible to draw any inference from measurement of the thorax, and in fat persons, especially in females, the results are often very unsatisfactory. To sum up—dilatation of the diseased side may be considered as one of the most valuable symptoms of empyema; but it is frequently wanting even in those cases where the effusion amounts to several pints; and as it may proceed from various other causes, such as pneumothorax, emphysema, and enlargement of the liver, so it cannot be relied on as a single symptom, though in combination with others it is a most valuable diagnostic mark of the disease. It should also be recollected that the diameter of the diseased side may be less than that of its fellow in consequence of the partial absorption of the effusion; indeed this case is by no means uncommon.

4. *Œdema of the side.*—Œdema of the integuments of the diseased side, extending sometimes to the arm and side of the face, is an occasional but no means a constant symptom of empyema; it sometimes occurs at an early stage of pleurisy, accompanied with pain and tenderness in consequence of the inflammation extending to the superjacent parts, and in some instances does not make its appearance before the last stages of the disease. Purple ecchymosed spots have also been observed on the most dependent part of the thorax. They are said to occur chiefly when the effusion is composed of blood.

5. *Fluctuation.*—This can sometimes be felt, in very thin subjects, through the intercostal muscles. In a patient who was recently operated on in the Richmond Hospital in Dublin, it was very evident. It is one of the least fallible signs of empyema, but yet should not be trusted to exclusively, as abscesses occasionally form in the parietes of the chest, which yield a similar sensation to the finger. In November, 1830, a subject was placed on the table in the dead room of the Whitworth Hospital, with considerable enlargement of the right side, and distinct fluctuation in the intercostal spaces. On removing the integuments, we discovered that both the enlargement and the fluctuation were caused by an enormous abscess of the liver, which had made its way through the diaphragm near its anterior attachment to the ribs, and had thence poured its contents into the cellular tissue which invests the muscles on the side of the chest, and thus produced the sense of fluctuation so distinctly felt between the ribs. A case nearly similar is recorded by Morand, who performed the operation of paracentesis between the third and fourth false ribs, in a case which he supposed to be empyema from the œdema of the integuments and deep-seated fluctuation; but he

found to his surprise that the chest was perfectly sound, and that the pus which was situated in front of the pleura came from an abscess in the liver. (*Richter*, Chir. Bibl. t. iv. p. 146.) We have likewise heard of an encephaloid tumour, projecting between the ribs, having been mistaken for a case of empyema pointing externally, and opened accordingly.

These examples are sufficient to show the importance of carefully examining every symptom of the disease, instead of trusting exclusively to any one sign, however unequivocal it may appear. Fluctuation is much more frequently perceptible through the intercostal spaces when the empyema is circumscribed, than when the fluid is effused into the general sac of the pleura; in the former case it not unfrequently points externally, and by its rupture affords an exit to the encysted matter. When these fluctuating tumours communicate with the bronchi through the substance of the lungs, they usually acquire an emphysematous feel, as in the remarkable case related by Dr. Duncan, in which several tumours of this description were formed over the surface of the diseased side. (Medico-Chirurgical Transactions of Edinburgh, vol. i.)

6. *Ægophony.*—The peculiar modification of the voice, termed ægophony, scarcely deserves to be enumerated among the signs of empyema, as it is only heard in those cases of effusion where the fluid interposed between the surface of the lung and the interior of the chest forms a thin layer of only a few lines in thickness. Whenever the effusion exceeds this quantity, the ægophony invariably ceases; and hence it is seldom audible in empyema, where the effusion is generally very extensive, and accumulates in the most dependent part of the chest, instead of forming a thin layer over the surface of the lungs, as in cases of recent pleurisy. Whenever, therefore, ægophony continues to be heard in cases of chronic effusion accompanied with cough, difficulty of breathing, and hectic fever, we may infer with tolerable certainty that the empyema constitutes an inconsiderable part of the disease, and that tubercles, or some other morbid structure, are formed within the chest.

7. *Fluctuation on succussion.*—The sound of fluid splashing within the chest, similar to that produced by agitating a cask partly filled with water, may sometimes be heard on applying the ear to the chest while the body of the patient is gently shaken. This sound has generally been described as the most pathognomonic sign of empyema, but as it never occurs except when the pleura contains air as well as fluid, it should more properly be considered as a symptom of the empyema being complicated with pneumothorax, and consequently as affording a more unfavourable prognosis, especially where the pneumothorax proceeds, as it most commonly does, from the rupture of a tuberculous abscess in the lung. (See Pneumothorax.)

8. *Dull sound on percussion.*—When we employ percussion over the chest of an individual labouring under empyema, the difference of sound elicited from the healthy and the diseased side is very striking, the former being clear and hollow, while the latter is as dull as if it were the thigh that had been struck. When the effusion is so extensive as to occupy the whole side of the chest, the sound is perfectly dull all over that side, unless in those parts where the lung is retained in contact with the chest by old adhesions. When the effusion only occupies the lower part of the chest, the dulness of the sound is confined to that region; and in cases of circumscribed empyema the dull sound corresponds exactly to the surface of the effusion, if the fluid be in contact with the costal pleura; but when it is confined between the lung and mediastinum or diaphragm, or between two adjoining lobes of the lung, the sound on percussion is seldom appreciably altered, and hence the diagnosis of these affections is often extremely difficult.

9. *Absence of the respiratory sound.*—Over the same extent of surface, and for the same reason that the sound on percussion is rendered dull, the respiratory murmur is totally extinguished. This absence of the natural sound is in general very apparent, and is among the most constant of all the physical signs of empyema. There are, however, some sources of fallacy in the evidence furnished by the state of the respiration in this disease, which it is important to be acquainted with. In some cases where the respiratory murmur is completely extinct, the air still continues to enter the bronchial tubes, though it cannot penetrate into the cells, and thus bronchial respiration may be heard over the situation which the condensed lung occupies; and if the bronchial tubes be obstructed with mucus, the different varieties of mucous rattle may likewise be heard in the same situation. Another circumstance calculated to mislead is, that the puerile respiration of the sound side is sometimes transmitted along the parietes of the diseased side, and may thus lead the auscultator into the erroneous supposition that respiration was going on in the diseased side: this error may in general be avoided by observing, that the intensity of the respiratory murmur gradually diminishes as the stethoscope is removed from the sound side; and this criterion will be still farther confirmed by examining the ribs of the diseased side, which will be found in a state of inaction, if the respiratory murmur be really transmitted from the opposite side. Another source of error, still more calculated to convey a false impression of the true nature of the disease, arises from the lung being retained in contact with the parietes of the chest by old adhesions. In such cases the effusion cannot insinuate itself between the chest and the surface of the lung, so as to compress its substance or mask its sounds; and hence the respiration continues to be heard, more or less plainly, over an extent of surface corresponding to the internal adhesions; most commonly the lung is attached at its upper lobe, more rarely at its lower, and in some instances the attachment extends vertically from the apex to the basis. These extensive adhesions constitute one of the most perplexing obstacles to the detection of this disease. Whenever respiration is suspended in one lung, the other, if free from disease, invariably takes on a compensatory increase of action, and the respiration becomes

puerile: this phenomenon is therefore of considerable importance, as it announces the inefficiency of the opposite lung.

10. *Displacement of the heart.*—The science of morbid anatomy furnishes numerous examples of the strongest membranes yielding to the application of constant and gradually increased pressure; in empyema, and likewise in pneumothorax, the mediastinum yields to the distending force of the accumulated fluid, and allows the heart to be displaced by its pressure. When the left side is the seat of the effusion, the heart is thrust from its natural situation, either down into the epigastrium, where it may be seen and felt pulsating, or over to the right of the sternum, where its pulsation is sometimes so strong as to attract the attention of the patient. When the effusion is in the right side, the change in the heart's position is not in general so remarkable; but by careful examination with the stethoscope, it will generally be found to pulsate considerably to the left of its natural situation. In two cases, one of which we have already alluded to as having been lately operated on for empyema, the apex of the heart was distinctly felt striking against the stethoscope between the fourth and fifth ribs in the left axilla.

As, then, displacement of the heart is constantly produced by effusion into either sac of the pleura, and seldom if ever arises from any other cause, it may be considered as the most constant and least equivocal of all the signs of effusion, and, when joined with other symptoms and physical signs of empyema, may be regarded as quite pathognomonic.

11. *Depression of the diaphragm.*—The diaphragm in like manner yields to the pressure of the incumbent fluid, and descends into the abdomen, thrusting the abdominal viscera before it. When the right side of the diaphragm is depressed, the liver is protruded beyond the margin of the ribs, and has even been felt so low as the iliac fossa, (*Stoll*, Ratio Medendi.) Such cases have repeatedly been mistaken for enlargement of the liver. Of this a remarkable instance has been recorded by Roux, in a memoir appended to the third volume of Desault's works, where, in a case pronounced by one of the most eminent medical men in Paris to be an incurable enlargement of the liver, the true nature of the disease was discovered by Bichat, who performed the operation of paracentesis thoracis, and thereby saved the patient's life.

12. *Abdominal pressure.*—Another test of the existence of pleuritic effusion imagined by Bichat, and described by Roux in the memoir just quoted, is the effect of pressure on that side of the abdomen where the effusion is suspected to exist. According to those celebrated anatomists, pressure exerted on that side of the abdomen corresponding to the empyema, thrusts the diaphragm and the fluid which rests on it up into the thorax, and thus, by increasing the pressure of the effusion on the lung, produces an insupportable sense of suffocation. In those cases where we have employed this test, the result was the very opposite of that above stated; for while no uneasiness was produced by pressing up the diaphragm into that side where the effusion existed, any attempt to stop the free motion of the diaphragm at the other side, where alone respiration was still carried on, was most distressing to the patient. The same observation has likewise been made by M. Chomel, (Dictionnaire de Médecine, Art. *Pleurisie.*)

13. *Cough and Expectoration.*—The cough in empyema is generally short and single, and when there is no accompanying bronchitis, is often wanting altogether. If there be any expectoration it is generally catarrhal, unless when a communication is established between the bronchi and the fluid effused in the pleura; in which case the quantity of matter expectorated is sometimes so great as to threaten suffocation. This, however, can only occur when a large communication is suddenly formed, and opens directly into one of the principal bronchi; but in those cases where the rupture is small and communicates only with the lesser bronchi, the evacuation of the fluid must go on slowly and by small quantities at a time. In such cases it is often difficult to determine the source of the expectoration: some writers describe it as possessing a peculiar fetor which is quite characteristic. Laennec compares the smell to that of gangrene. (Page 447.) Professor Nespoli to the smell of assafœtida, "ma assai più di questa penetrante e acido." (Discorso, &c. Firenze, 1825.) Some have compared this odour to garlic, some to that of phosphoretted hydrogen, and others to other ill smells. (Dr. Forbes's Note to Laennec, p. 447.) But as these fetid smells have all been observed in the expectoration of gangrene, and even of simple bronchitis, too much importance should not be attached to this sign; more particularly as in many cases of fistulous communication between the pleura and bronchi no such fetor has been observed. When, however, this appearance of the expectoration is accompanied with a marked improvement of other symptoms, and with a diminution in the diameter of the dilated side, we may conclude that a communication with the bronchi has been formed; and this diagnosis will be still farther confirmed if the signs of pneumothorax supervene in consequence of the atmospheric air entering through the communication.

14. *Fever.*—The febrile symptoms which accompany this disease vary considerably, according to the constitution of the individual and the progress of the effusion: thus, while acute empyema is usually accompanied with rapid pulse, burning heat of skin, and other symptoms of the highest degree of febrile excitement, the more chronic forms of the disease often present no other symptom of fever than a slight acceleration of the pulse towards evening, or after taking food; and the patients sometimes even enjoy a state of perfect apyrexia.

It has been remarked by Broussais, and the observation has been confirmed by Andral, that the hectic of empyema is never accompanied with profuse night-sweats, unless when tubercles are developed in the lungs or in the false membranes of the pleura. Another peculiarity in the hectic of empyema, according to Broussais, is, that the pulse generally returns to its natural frequency after rest, particularly after a night's rest; whereas, in the hectic of phthisis, the pulse seldom or never comes down to its natural standard. The same author likewise states that in the hectic of empyema there is seldom any flushing of the cheeks, unless when the difficulty of breathing is very great, in which case the face and lips present a bluish tint and congested appearance, arising no doubt from the deficient aeration of the blood; whereas in phthisis the circumscribed flushing of the cheeks contrasts strongly with the marked paleness of the rest of the countenance. Whenever, therefore, the hectic fever of empyema presents the symptoms just described as appertaining to the hectic of phthisis, we may conclude that the effusion is probably complicated with tubercles in the lungs, or in the false membranes of the pleura.

From these observations it appears, that although there is no one symptom or physical sign which, taken singly, can be considered as pathognomonic; yet, from the combination of these symptoms with the physical signs derived from auscultation and percussion, the presence of empyema may be inferred almost with certainty. It must, however, be admitted that we occasionally meet with cases in practice in which it is extremely difficult to ascertain the existence of effusion. This difficulty, in some instances, depends on symptoms being present which appear incompatible with the presence of effusion, and in others on the only symptoms present being common to empyema with other affections, and consequently insufficient to decide the true nature of the disease.

To the former class belong those cases of empyema in which the lung is extensively attached to the costal pleura, and those of circumscribed effusion situated in the interior or bottom of the chest; in both of which cases, contrary to what usually occurs in empyema, the respiration continues audible, and the sound on percussion is little if at all affected. The diagnosis of these cases has already been the subject of consideration.

The diseases which from the similarity of their general symptoms and stethoscopic phenomena are most liable to be confounded in practice with empyema, are tubercular consumption, hepatization of the lung, the development of morbid growths in the pleurá, and, when the disease is at the right side, enlargement of the liver.

We shall now offer a few remarks on the distinctive characters of these different affections.

1. *Tubercular Consumption.*—The general symptoms of phthisis and empyema are sometimes so precisely similar as to have deceived even the most experienced practitioners. The stethoscopic phenomena of these diseases are, however, so very characteristic, that it is scarcely possible now to confound them. In the first stage of phthisis, when the tubercles are in their crude state, the respiratory murmur is seldom if ever so completely suppressed as in empyema. In the former disease the absence of respiration first commences, and is always most marked, in the upper lobe, and in the latter in the lower lobe. At a more advanced stage, when the tubercles are softened, the characteristic signs of pectoriloquy, mucous râle, and guggling cough, at once point out the true nature of the disease, and prevent the possibility of mistaking it for empyema.

2. *Hepatization of the Lung.*—Owing to the similarity of the stethoscopic phenomena which hepatization presents, it is much more likely to be confounded with empyema. The following signs will, however, seldom fail to enable the physician to distinguish these diseases. In hepatization the antecedent symptoms are those of the first stage of pneumonia, and the cough is usually attended with characteristic viscid sputa; the respiration is never totally suppressed, but its place is supplied by strong bronchial respiration and resonance of the voice; the side is never enlarged; the intercostal spaces are never protruded; and the heart is never displaced; either of these symptoms occurring, will, therefore, at once decide in favour of empyema. To these distinctive characters we may add that chronic empyema is, comparatively speaking, a disease of common occurrence; whereas chronic hepatization is an affection so rare, that Laennec commences his chapter on the subject by questioning the reality of its existence. This opinion is confirmed by the experience of Andral, who states (Op. cit.) that of one hundred and twelve cases of pneumonia treated in La Charité only one exceeded thirty days, or could be regarded in the light of a chronic disease. Chomel and Louis likewise concur in describing chronic peripneumony as one of the rarest forms of pulmonary disease.

3. *Tumours in the sac of the Pleura.*—The same remark is likewise applicable to the development of those tumours in the pleura which compress the lung and occupy its place. A remarkable case of this kind is related by Corvisart in the "Bulletins de la Faculté de Médecine." The patient's symptoms were such as to lead this accurate observer into the belief that the disease was empyema; but, on dissection, he was surprised to find instead of pus a solid substance answering to Laennec's description of encephaloide, occupying the entire of the left side, the lung having, as he describes it, totally disappeared. An analogous case is recorded by Boerhaave, as occurring in the person of the Marquis de St. Auban. (*Zimmerman*, Traité de l'Expérience.) M. Recamier found in the body of a patient whom he considered as affected with empyema, one side of the chest entirely filled with a mass of tuberculous matter. A still more remarkable example of this disease is recorded by Laennec (Op. cit.), to whom it was communicated by M. Cazol.

4. *Enlarged Liver.*—The last disease which we shall enumerate as liable to be confounded with empyema is enlargement of the liver. This viscus is sometimes so much increased in size as to ascend into the thorax, and compress the lung into the upper and back part of the chest. In such cases the sound on percussion is as completely dull, and the respiratory murmur as perfectly extinct, as in empyema. Neither is the diagnosis always facilitated by referring to the earlier symptoms of the disease, as empyema is often ushered in with the same dull pain in the hypochondrium that usually attends hepatic disease; and the projection of the liver beyond the margin of the ribs may proceed either from enlargement of that organ, or from its being thrust down by the pressure of the superincumbent fluid. Such are the principal points of similitude between these diseases, which have frequently imposed on

the most experienced practitioners, but which it is of the greatest importance to distinguish, as is exemplified in the case already quoted from the memoir published by Roux, where the life of the patient supposed to be labouring under incurable disease of the liver was saved by the operation for empyema, which the accurate discernment of Bichat discovered to be the real disease. It is only necessary to allude here to the possibility of mistaking these diseases one for the other, as it seldom happens that their diagnosis is not rendered sufficiently easy by the presence of some equivocal symptom, either of hepatic disease or of empyema.

Prognosis of Empyema.—The prognosis in this disease is generally unfavourable, as by far the greater number of cases terminate fatally, whatever treatment is adopted. But as empyema is more properly the termination of a pre-existing disease than a primary or specific affection, it is impossible to form a correct prognosis of its probable termination in any given case without taking into consideration the character of the pre-existing disease and the condition of the lung and pleura, as well as the amount of the effusion and the possibility of its removal; for on these circumstances the issue of the case principally depends. Thus, for example, while the empyema produced by the rupture of a tuberculous abscess in the lung has never, as we believe, been known to terminate otherwise than in death, the empyema which succeeds to penetrating wounds of the chest has in a great number of cases terminated favourably. (See Baron Larrey's Mémoire sur les effets de l'opération de l'empyème, Chirurgie Militaire.) In the former case the effusion is produced by, and complicated with an incurable affection of the lung, while in the latter it is unconnected with any organic disease of the thoracic viscera.

In acute empyema, when the effusion increases rapidly, and is accompanied with great difficulty of breathing and febrile excitement, the disease may prove fatal by suffocation during the acute stage, or, as more frequently happens, may degenerate into the chronic form.

In chronic empyema, whether proceeding from acute or chronic pleurisy, the termination of the disease, when abandoned to the resources of nature, is almost invariably fatal; though, if we could place implicit confidence in the representations of the older writers, it would appear by no means uncommon that it should terminate by absorption, or even by critical evacuation. Billard states that a case of empyema, on which he was on the point of operating, terminated favourably by a critical sweat, produced and kept up by the internal use of the acetate of ammonia, which he therefore recommends as a most efficacious remedy in this disease. (Dictionnaire des Sciences Médicales, Art. *Empyème.*) The effusion of empyema has also been stated to have passed off, by metastasis, from the intestinal canal, from the bladder, from the vagina; and is said in one instance to have vanished on the eruption of a scabies. (Good's Study of Medicine, vol. 2.) Dr. Darwin relates the following extraordinary instance of recovery from this disease:—A servant man, after a violent peripneumony, was seized with symptoms of empyema, and it was determined after some time to perform the operation: this was explained to him, and the usual means were employed by his friends to encourage him, by advising him "not to be afraid," by which good advice he conceived so much fear that he ran away early next morning, and returned in about a week *quite well.* Without, however, incurring the imputation of scepticism, we may perhaps be permitted to doubt the accuracy of these observations, and to question whether the disease thus marvellously cured had ever existed, especially as we have seen how very inadequate the means of ascertaining the existence of the disease were in those days.

Of eighteen cases of chronic pleurisy recorded by Broussais in his "Histoire des Phlegmasies Chroniques," only one ultimately recovered. Laennec likewise states that the disease has seldom any natural tendency towards resolution, and this statement has been so fully confirmed by the experience of modern physicians, that doubts are now very generally entertained whether the fluid is ever removed by absorption in cases of genuine empyema; and, accordingly, it has been recommended on high authority, that the operation of paracentesis should be performed as soon as ever the presence of empyema can be ascertained with certainty, "In tali casu," says Willis, "pharmacia haud multum opus erit, sed tantum corpore preparato illico ad lateris apertionem procedatur. (De Empyemate, p. 97.)

But although the instances of recovery from this disease by the absorption of the effusion are not sufficiently numerous to inspire us with much confidence in the efficacy of the remedies usually employed for that purpose, still there are a sufficient number of well-authenticated facts to prove the possibility of the disease terminating in this favourable manner, and, consequently, to establish the propriety of trying the effect of appropriate remedies before having recourse to the operation, unless in those cases where the effusion is so extensive as to preclude all reasonable prospect of its absorption, or the symptoms of suffocation so urgent as to require the immediate evacuation of the fluid.

Treatment.—In order to promote the resolution of this disease, the first object of *medical* treatment should be to moderate any febrile excitement which may arise, as experience has fully proved that a state of perfect apyrexia is the most favourable condition for the absorption of the effusion; for this purpose it is seldom necessary to have recourse to general blood-letting, unless in cases of internal hemorrhage. Cupping over the part or leeches may occasionally be applied with advantage when an exacerbation of the pain and other symptoms indicates the supervention of a fresh attack of inflammation on the diseased surface; but a rigid enforcement of the antiphlogistic regimen will be found the most effectual method of subduing the fever. "This point is of such paramount importance," says M. Broussais, "that I regard it as the basis of the treatment in all those chronic affections of the chest which are sufficiently violent to excite fever; indeed, the physician cannot be too strongly impressed with the idea that, so long as any fever continues, *the more his patient eats the shorter time he lives,* and that by lowering his diet he will take a more prompt and effectual method of removing the febrile paroxysms than by repeated bleedings, or by covering his chest with blisters." (Phlegmasies Chroniques, vol. i. p. 355.) These observations are particularly applicable to those paroxysms of fever which supervene during the course of chronic pleurisy: for so long as they continue, any attempt to repair the strength by the use of nutritious diet will only aggravate the fever and increase the consequent debility. When, however, the fever subsides, it is of the greatest importance to support the patient's strength by the use of light nutritious diet, and even by the administration of tonics and stimuli when required, taking care, however, to avoid pushing the tonic treatment so far as to reproduce fever. At the same time, the absorption of the fluid may be promoted by increasing those natural discharges of which nature sometimes avails herself, as of so many emunctories, for the evacuation of internal suppurations, and by exciting artificial discharges from the surface by the use of counter-irritants and derivatives.

Purgatives, according to Laennec, to be useful, ought to be pretty frequently repeated. They are particularly indicated subsequently to blood-letting, when the abundance of the effusion, or the rapidity of its formation, and the general symptoms, give reason to presume that the pleurisy is hemorrhagic.

On the same authority, diuretics are said to have no evident effect upon the absorption, unless they are given in larger doses than is customary. He was in the habit of carrying the acetate of potass to the extent of six drachms or even of two ounces in the day, and gave nitre in doses of from forty grains to three or four drachms if the patient bore it well. With this latter Laennec sometimes combined sal ammoniac, according to the method of Triller, and also gave with advantage the extract of squills, as recommended by Quarin, in a minimum dose of two grains every three hours. (Dr. Forbes's Translation of Laennec, p. 473.)

Diaphoretics and expectorants have likewise been found serviceable in some instances, and may therefore deserve a trial, especially in those cases where the efforts of nature manifest any tendency to produce a critical evacuation by diaphoresis or expectoration, in which case the propriety of promoting the discharge established by nature is manifestly indicated.

So long as any fever is present, counter-irritants of any kind should be employed with the greatest caution; but when the febrile symptoms subside, a large blister may be applied with advantage over the affected side, and kept open for several days, provided it does not produce much constitutional irritation. If the effusion does not diminish under this treatment, it will be advisable to heal the blistered surface and try the effect of a different kind of counter-irritant; for this purpose setons or caustic issues may be used, but, in order to produce any decided effect, they should be kept discharging for a considerable length of time. The use of the moxa is strongly recommended by Baron Larrey, who states that he has seen it act most beneficially as a revulsive in several cases of empyema. (See Observations sur les Effets de Moxa, in the Journal Complémentaire, tom. v.) The actual cautery is another powerful revulsive, which was much employed by the older surgeons, who seem to have frequently had recourse to it with decided benefit as a means of establishing a counter-irritation and derivation from the diseased pleura.

There is another mode in which the efforts of nature occasionally effect a cure in this disease, namely, by the formation of a fistulous passage through the lungs or through the walls of the chest, which serves as an outlet to evacuate the matter contained within the pleura. This spontaneous evacuation of the matter of empyema occurs chiefly, if not exclusively, in those cases where the empyema is circumscribed, and the fluid is prevented from escaping laterally by adhesions. When no such adhesions exist, the fluid, having full liberty to accumulate within the chest, seldom points externally; and, accordingly, it is extremely rare to find any appearance of erosion or ulceration in the costal or pulmonary pleura when the effusion occupies the general sac of the pleura, though such appearances are by no means uncommon when the effusion is circumscribed.

Laennec states that the spontaneous evacuation of the matter of empyema is more frequently effected by rupture into the bronchi than by ulceration through the walls of the chest; but in comparing the records of those cases which have been published in this country as well as in France, it appears that their comparative frequency is pretty nearly equal.

When the matter bursts into the bronchi, the communication is generally formed by the detachment of a gangrenous eschar, or by erosion and ulceration of the pleura and pulmonary substance. The passage thus formed is usually lined with an adventitious membrane, which prevents the matter from infiltrating the tissue of the lung, and conducts it directly into the bronchi, from whence it is subsequently removed by expectoration. Many instances of this mode of the escape of pus are on record. Dr. Forbes met with a case of this kind, and has had several undoubted instances related to him by practitioners. (Op. cit.) Broussais gives two cases of gangrenous perforation of the pleura pulmonalis, and another in which the communication seems to have taken place from simple ulceration. Le Dran met with four cases in which the disease terminated in this way. A case of rupture of a circumscribed empyema into the bronchi, followed by a copious expectoration of fetid matter, lately fell under the observation of the writer of this article. Laennec also has seen the effusion of chronic pleurisy burst into the bronchi, and Andral observed a similar occurrence in a case of acute empyema. Several other cases may likewise be found in the periodical literature of this country.

When the empyema is about to make its way outwards through the parietes of the chest, the escape of the matter is usually preceded by the appearance of a soft, doughy, inelastic swelling of the integuments, which generally advances in the course of a few days, so as to form a distinct fluctuating tumour, and either breaks spontaneously, or else requires an artificial opening to be made through the integuments, in order to give issue to the matter contained underneath. This ulcerative process generally commences in the costal pleura or in the false membranes with which it is lined, and passes in succession through the superincumbent parts; sometimes, however, it commences by the formation of an abscess in the walls of the chest, which, bursting both externally and internally, forms a fistulous passage for the escape of the contained fluid. Instances of this termination of empyema are to be found in the writings of almost every author who has treated on this subject. Andral gives three cases in which the matter made its way through the intercostal spaces, and a fourth in which it perforated the diaphragm. Several similar cases are recorded in Le Dran's observations, and in other works on surgery.

The escape of the matter either through the bronchi or through the walls of the chest is generally followed by immediate relief of all the most urgent symptoms, and in some cases the fistulous passage soon ceases to discharge, and cicatrizes; but in other instances the fistula remains open for several months, or even years, and continues to discharge a greater or less quantity of matter, until the suppurating surface gradually diminishes, and becomes at length obliterated by the cohesion of the walls of the abscess. Sometimes, however, the evacuation of the matter, so far from producing any alleviation of the symptoms, seems only to aggravate the disease and accelerate its fatal termination. (See the seventeenth case in the second volume of Andral's Clinique Médicale.)

In some cases the formation of one outlet is followed by the formation of several others in succession, as in a remarkable instance published by Dr. Duncan, in the 28th volume of the Edinburgh Medical Journal. A still more remarkable case of this kind is related by Dr. Betty, in the London Medical Repository for March, 1828.

This successive formation of several outlets for the evacuation of the matter of empyema occurs chiefly in those cases where the matter is confined in distinct compartments, having no communication one with the other, and, consequently, requiring each a separate outlet for the evacuation of its contents. A second orifice is also occasionally required when the outlet first formed is situated in the upper part of the chest; for in such cases that portion of the fluid which stands below the bed of the outlet has no means of escaping unless by the formation of another passage in a more dependent situation.

Paracentesis.—When, however, as too often happens in this disease, there exists no reasonable prospect of the effusion being removed by absorption, or evacuated by the efforts of nature, there yet remains the alternative of making an opening into the chest, and thus creating an artificial outlet for the discharge of the matter. This constitutes the operation of *paracentesis thoracis*, or, as it is sometimes called, the operation of empyema.

This operation is at all times easy of execution, productive of little pain to the patient, generally followed by immediate relief, and has in numerous instances been crowned with complete success. Sprengel, in his erudite work on the history of medicine, enumerates amongst the advocates of this operation the names of almost all the most distinguished medical and surgical writers, from Hippocrates downwards, many of whom from their writings appear to have practised this operation with a degree of confidence and success unknown at the present day. The same work likewise contains brief notices of such a vast number of cases in which the result was favourable, as are more than fully sufficient to establish the frequent success of this operation.

If, however, we reflect that empyema is generally the effect of a pre-existing disease of the lungs or pleura, and that the effect of the operation is merely to remove the effused fluid, while the disease of the solids still remains behind, we must be prepared to expect that this operation should often fail of success.

Another cause of the failure of this operation is the condensed condition of the lung, which, from long compression, has lost its expansibility and elasticity. In consequence of this it slowly regains its natural dimensions; and in some cases the unfolding of the lung is still further opposed by the formation of false membranes on its surface. The space thus left between the lung and the walls of the chest by the evacuation of the fluid is filled with atmospheric air, which rushes in through the wound, and excites a purulent discharge, so copious as to exhaust the patient's strength, while the inflammation it causes in the suppurating surface cannot produce the obliteration of the cavity, the parts being still too far apart to be agglutinated.

It sometimes happens, also, that the operation is followed by the decomposition of the matter discharged from the wound, which assumes a dark ichorous appearance, and exhales an odour insupportably fetid. This alteration in the sensible qualities of the secretion is generally attributed to the irritating effects of the atmosphere on the imperfectly organized membranes with which the pleura is lined.

These considerations should certainly make us cautious in having recourse to the operation so long as there remained a reasonable prospect of the fluid being removed by other means, but should not deter us from the practice in those cases where other remedies had been tried and found ineffectual, or where the urgency of the symptoms precluded all reasonable prospect of relief from their use. In such cases the sooner the operation is had recourse to the better; for, as Willis tritely observes, "dummodo vires constabunt praestat remedium anceps experiri quam nullum." (De Empyemate, p. 97.) Our greatest modern authority on the subject of pulmonary diseases, Laennec, was a great advocate for the performance of the operation. (See Translation, p. 191.)

Notwithstanding these strong attestations in its favour, the operation has latterly fallen very much into disuse, as much, perhaps, from the uncertainty of the signs of empyema as from any experience of its general inutility or danger. Now, however, that the diagnosis of this disease no longer presents the same difficulties as it did formerly, and that we are enabled to recognize at any early period of their progress, those cases which may be benefited by the operation, and thereby have it in our power to operate early, and consequently with better chance of success, it is probable that the operation will be employed more frequently and more successfully than it has hitherto been.* Within the last year the operation has been twice performed by the advice of Dr. Marsh, of Dublin, and in both instances the success of the operation has been complete. Dr. Crampton, and Mr. Crampton, the surgeon-general of Ireland, have also communicated to the writer the particulars of three cases from their practice, in which the operation was equally successful.

The result of these cases is highly favourable to the more general adoption of the practice, and fully confirms the observation of a modern author, "that it is a measure which has frequently proved successful, and that too in a disease which is generally, if not always, beyond the influence of medicine, and too often beyond the power of nature to remove." (Forbes's Original Cases, &c., p. 258.)

There are two cases in which this operation is particularly indicated: — 1. In acute empyema, when the breathing is extremely oppressed, and the effusion goes on rapidly increasing. In this form of the disease, however, it is always advisable, if possible, to defer the operation until the inflammatory symptoms shall have subsided, as it will be of little advantage to evacuate the contents of the pleura so long as that membrane continues in such a state of inflammation as to reproduce the effusion. When, however, the difficulty of breathing is so great as to render the immediate performance of the operation necessary in order to prevent the risk of suffocation, it is probable that this object may be sufficiently attained by making small punctures with a trochar from time to time, when the breathing becomes much oppressed, and drawing off only so much fluid as is necessary to diminish the pressure exercised by the effusion on the opposite lung. By operating in this way the breathing will be immediately relieved, and the danger avoided of admitting the atmospheric air into contact with an already highly inflamed pleura. Perhaps, too, this partial abstraction of the effusion may at once aid the absorption and accelerate the conversion of the false membranes; such, at least, is the opinion of Laennec, (Op. cit.)

When acute empyema succeeds to penetrating wounds of the chest, it is advisable not to operate before the orifices of the wounded vessels are so firmly closed as to prevent any danger of a recurrence of hemorrhage; for this reason Baron Larrey recommends that the operation should not be performed in such cases before the seventh, or deferred after the eleventh, or, at the farthest, the fourteenth day.

2. The second case in which this operation is particularly indicated, is in those cases of chronic empyema where the ordinary means for promoting absorption have been tried and found ineffectual. In such cases it is impossible to lay down any general rule as to the precise period at which the operation should be performed, as that point must be determined by the state of the constitution, the urgency of the symptoms, and the extent of the effusion, rather than by the date of its formation. So long as any reasonable prospect can be entertained of the disease being removed by the efforts of nature, or the influence of medicine, the effects of remedies should of course be tried, but at the same time it should be borne in mind that this disease is generally, if not always, beyond the power of medicine to relieve, and that the persisting in the employment of remedies which experience has so often proved ineffectual, can only tend to diminish the ultimate chance of success by deferring the operation, as is too often done, until the effusion becomes so extensive, and the patient's strength and constitution so exhausted, as almost to preclude the possibility of recovery.

It has been proved by experience that the operation is frequently successful when the patient is young and of good constitution, the effusion mod-

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* We learn that in London the operation has been repeatedly performed, more particularly under the direction of Dr. Thomas Davies. For the following tabular view we are indebted to the kindness of that intelligent physician, by whose advice the operations were performed. Dr. Davies has requested us to state that five of the cases belonged to Dr. B. Babington, and one to Dr. Strond; Dr. Davies was only called into consultation by these gentlemen.

Nature of the case.	Operator.	Event of the cases.		
		Recovered.	Under treatment.	Died.
Empyema	Mr. Stukely, late Apothecary to the Infirmary for Diseases of the lungs	"	"	1
"	Mr. Martin, Surgeon, R. N.	1	"	"
"	Mr. Headington	1	"	"
"	Mr. John Scott	"	"	1
"	Mr. Herring, Apothecary to the Infirmary for Diseases of the Lungs	3	"	"
"	Mr. Kiernan	2	"	"
"	Dr. B. Babington	1	"	"
"	Mr. Skey	"	1	"
	Total Empyema ..	8	1	2
Pneumothorax, with effusion ..	Mr. Headington	"	"	3
"	Mr. John Scott	"	"	2
"	Mr. Kiernan	"	"	3
"	Mr. Smith	"	"	1
	Total pneumothorax ..	"	"	9
Hydrothorax ...	Mr. Herring	"	"	1
"	Mr. Kingdom	"	"	2
	Total hydrothorax ..	"	"	3
	Grand total .. Number of cases 23	8	1	14

Notes by Dr. Davies. — 1. The result of the operation in the cases of empyema is very satisfactory; eight of the patients out of ten having recovered. Of these, five were under six years of age, one was between eighteen and nineteen, and two were above twenty-five.

2. All the cases of pneumothorax were complicated with tubercular diseases of the lungs, a circumstance which, of itself, precluded a favourable result. All the patients were beyond twenty years of age.

3. All the cases of hydrothorax were the consequences of disease of the heart. Although none of the patients recovered, they were all relieved by the operation for a considerable time.—EDITORS.

erate in quantity, recently formed, and unaccompanied with organic disease of the lungs. On the other hand, the prospect of success diminishes considerably when the effusion is very extensive, of long standing, and accompanied by symptoms of confirmed hectic.

The copiousness of the effusion, however, though it generally diminishes the chances of recovery, does not necessarily preclude the success of the operation. Baron Larrey operated successfully in a case where the effusion amounted to fifteen pints; Dr. Hawthorne's patient lost twenty pints of pus during the first twenty-four hours; and in Dr. Archer's successful case, already quoted, eleven pints of fluid were drawn off at the first evacuation. The same remark is likewise applicable to the length of time during which the empyema has existed, and to the symptoms of hectic with which it is accompanied, as there are several cases on record where the operation was successfully performed under those unfavourable circumstances, (Dictionnaire des Sciences Médicales, art. *Empyème.*

In the numerous class of cases where empyema is complicated with pneumothorax from the rupture of a tuberculous abscess in the lung, the chance of any permanent advantage from the operation must necessarily be very small, in consequence of the incurable nature of the original disease: in such cases, indeed, little else can be hoped for from the removal of the effusion than a temporary alleviation of suffering, or the prolongation of existence for a few weeks or months at the utmost; such, at least, is the conclusion that we have formed, after having witnessed the progress and fatal termination of eighteen cases of this nature, in five of which the operation was performed with no better success than that just described. (See Pneumothorax.) Laennec, however, is of opinion that "we must not abandon all hope of cure, even when there exists so serious a complication as this, provided there be no evidence of cavities in the opposite lung." (Op. cit.)

The complication of pneumothorax does not seem to form so serious an objection to the operation, when not coupled with the presence of tuberculous abscesses in the lungs, as appears from its having been successfully performed in several cases where the sound of fluctuation, audible in the chest, sufficiently proved the coexistence of a gaseous and liquid effusion. Dr. Archer's remarkable case of this kind, published in the Transactions of the Association, has already been alluded to. A still more remarkable case of empyema with pneumothorax, terminating successfully by operation, is related by Dr. G. Hawthorne, in the Edinburgh Medical and Surgical Journal, No. 61.

Neither does the existence of a fistulous passage through the lungs necessarily preclude the success of the operation, as is evident from those cases where it was performed after the empyema had burst internally into the bronchi, and yet the communication thus formed through the lung did not appear in the least to impede the patient's ultimate recovery. Le Dran relates a case on which he operated for empyema where "the injection of a small quantity of mel rosarum and barley-water through the wound excited coughing, and part of it passed off by the mouth, mixed with pus;" thus clearly proving the existence of a fistulous passage through the lung, notwithstanding which the patient recovered completely. Several similar cases are quoted in the Dictionnaire des Sciences Médicales, from the writings of MM. Jaymes, Robin, and Bacqua. In these cases, however, the empyema must in all probability have been circumscribed, and the lung retained by adhesions in contact with the walls of the chest around the circumference of the wound; or else the injection, instead of entering the lung, would have fallen to the bottom of the pleura.

It is unnecessary here to enter into any minute description of the mode of performing the operation, as this is described in all treatises on the subject and in all systems of surgery; but the reader is more particularly referred to the works of Le Dran, Richter, Sharp, C. Bell, Larrey, and Boyer, [Ferguson, and Liston,] where he will find all the necessary information.

[For the removal of the fluid, Drs. Prichard and Babington have recently recommended instruments, which are described under Ascites, (page 188,)—and should any doubt exist as to the presence of fluid, a grooved or exploring needle, as advised by Dr. Thomas Davies, (*Lectures on Diseases of the Lungs, &c.*, Lond. 1835,) may be passed into the chest, by which not only the presence but the character of the effused fluid may be safely determined.]

Authors make a distinction in the operation according as the matter points externally or not. The former they term the *operation of necessity*, from its site being necessarily fixed: and the latter the *operation of election*, from the surgeon being at liberty to select at what part of the chest he makes his incision.

In the empyema of necessity, as it is termed, when the matter points externally, the sooner an incision is made into the tumour the better, as there is no chance of the matter being removed by absorption, and the consequence of delaying the operation has too often been the formation of long sinuous passages through the parietes of the chest and abdomen, and caries of the ribs. Indeed this operation is much more generally successful than that performed at the place of election, which no doubt arises from the circumstance that those empyemas which point externally are almost invariably circumscribed, and confined to a small extent of the pleural sac.

When no tumour appears, to fix the site of the operation, the place of election generally recommended by surgeons in this country is between the sixth and seventh true ribs, where the indigitations of the serratus major anticus muscle meet those of the obliquus externus. Laennec prefers the space between the fifth and sixth ribs. "Many reasons (he says) point out this spot as the best suited for the operation: for instance, we know that the upper lobe adheres to the ribs more frequently than any other part of the lungs, and that the lower lobe is frequently attached to the diaphragm, while adhesions very seldom exist at the central part of the chest; and even should there chance to be any old adhesions in this point, they may be readily and certainly discovered by some remains of respiration over their site, and the place of the operation may then be varied accordingly: besides, we know that the thickest false membranes exist at the junction of the diaphragm with the walls of the chest, and that at the right side an enlarged liver frequently reaches as high as the sixth or even as the fifth rib;" in which case, when the operation is performed in the usual situation, the instrument, instead of entering the chest, would transfix the diaphragm and penetrate the abdomen; there are several cases on record of the operation having been frustrated by this accident. Laennec informs us that in a case of pleuro-pneumothorax, after making an incision through the integuments between the fifth and sixth ribs, he thrust the trochar, as he thought, into the thorax, and was much surprised to find that no fluid followed its introduction; but on dissection he discovered that the instrument had entered the cavity of the abdomen, after transfixing the diaphragm, which had been thrust up into the chest by an enlargement of the liver, and had contracted a firm adhesion, to the seventh rib. (Op. cit.) A similar accident happened to La Motte, (Traité complet de Chirurgie, vol. ii. obs. 77, p. 292;) and Solingen saw the diaphragm wounded by the introduction of a canula after the operation, which was performed between the first and second of the false ribs. (Handgriffe der Wundarzney, Th. ii. Kap. i. p. 175.) The only object of operating so low down is to make the opening at the most dependent part of the chest for the more complete evacuation of the effusion; but this object may be sufficiently attained by operating between the fifth and sixth ribs, which may in fact be made the most dependent point of the chest, by causing the patient to lie, as he generally feels disposed to do, on the diseased side. The danger of wounding the intercostal artery may be avoided by making the incision close to the superior edge of the lower rib. [See on this subject Stokes *on the Chest*, Amer. edit. p. 483, Philad. 1844. Recently the writer directed the operation to be performed in a case of chronic pleurisy. The operator, in accordance with the recommendations of Dr. Ferguson, (*A System of Practical Surgery*, Amer. edit. p. 530, Philad. 1843,) selected the seventh rib, a little in front of the angle, for the place of puncture, but no fluid escaped. On repeating the operation immediately above the fifth rib, half way between the spine and the sternum of the right side, he was completely successful.]

When the incision is carried through the parietes of the chest and the false membranes with which they may be coated, a rush of fluid is immediately expelled by the pressure of the parietes, and continues to flow in an uninterrupted stream until the surface of the fluid falls to the level of the wound, after which it issues in a series of interrupted jets corresponding to the motions of the diaphragm; for as this muscle descends in inspiration, the fluid which lies on its surface sinks along with it, and the atmospheric air rushes in to fill up the space created by its descent: again, as the diaphragm rises in expiration, the incumbent fluid is elevated to the level of the orifice, and issues in a jet from the wound; this alternate sucking in of air and expulsion of fluid continues until the quantity of matter is diminished so as no longer to rise to the level of the wound during expiration, after which each movement of the diaphragm is followed by the alternate introduction and expulsion of air, so long as the wound is allowed to remain open. Many reasons, however, render it inexpedient to continue the operation to this period. The sudden removal of so large a quantity of fluid frequently produces such a shock to the nervous system as throws the patient into an alarming state of collapse; the withdrawing so great a degree of pressure from the heart and large blood-vessels and from the opposite lung must likewise derange materially the functions of these important organs, and consequently oppose the success of the operation; and another injurious consequence of protracting the operation until all the fluid has been evacuated is, that the parietes of the chest are unable to accommodate themselves to the space which is thus left unoccupied, and which must consequently be filled with atmospheric air.

For these reasons it is advisable to close the wound before the fluid begins to issue in an interrupted stream, and to repeat the evacuation at longer or shorter intervals, according to the extent of the effusion and the urgency of the symptoms. In general, the removal of twenty ounces of fluid at a time will be found sufficient to relieve the breathing, (as this effect is produced, at least in the first instance, by diminishing the pressure on the opposite lung, and not by restoring the functions of the organ at the diseased side,) and an interval of forty-eight hours may be allowed to elapse before the wound is again opened. When, however, the effusion is very extensive, and the breathing not sufficiently relieved by the removal of the quantity above specified, the fluid may be allowed to flow for some time longer, or the evacuation may be repeated at shorter intervals. When the principal part of the effusion has been removed in this way, a large poultice may be applied over the wound, and the remainder of the fluid allowed to escape as fast as it is secreted.

By this method of gradually removing the effusion, we diminish the shock to the nervous system, relieve the thoracic viscera gradually from the pressure of the accumulated fluid, and prevent the introduction of air into the thorax, until the parietes have had time to accommodate themselves to the diminished volume of their contents, and by their mutual approximation diminish, to the utmost, the space left by the evacuation of the effusion.

The following measurements taken from a patient of twelve years old, who lately underwent this operation, will serve to illustrate the diminution which takes place in the capacity of the diseased side by the falling in of its osseous parietes:

	Circumference of the diseased side.		Circumference of the sound side.	
	In.	*Lns.*	*In.*	*Lns.*
Immediately before the operation	16	6	14	1
Evening after the operation	16	3	14	1
6th day after the operation	14	10	14	1
7th day after the operation	14	6	14	1
8th day after the operation	14	5	14	1
9th day after the operation	13	9	14	1

Thus, in the space of nine days, the circumference of the diseased side diminished nearly three inches. This contraction of the osseous parietes, aided by the ascent of the diaphragm, and the protrusion of the mediastinum from the increased dilatation of the opposite lung, reduced the cavity of the diseased side to so small a compass, especially in young subjects, whose ribs are susceptible of a much greater degree of motion than those whose cartilages are ossified, as to leave very little space unoccupied for the reception of air. This space is subsequently filled up as the lung gradually expands and rises into contact with its pariétes; this, however, is always a very slow process, as several weeks in general elapse before the slightest trace of respiration can be perceived in the diseased side; as the lung continues to expand, the contraction of the side gradually diminishes, until at length the lung resumes its original dimensions and the contraction of the side disappears altogether. In some cases, however, the dilatation of the lung is never complete, and the side remains permanently contracted in consequence. Lastly, there are some cases in which recovery takes place, although the lung never expands so as to fill the space left by the evacuation of the empyema. In these cases the wound made by the operation is converted into a permanent fistula, through which the atmospheric air is allowed to enter, and the matter secreted by the walls of the cavity to escape, without producing any very considerable inconvenience to the patient's health. Several cases of this termination of the operation are recorded by Plater and Schenkius, and by MM. Lefacheux and Audouard. (See *Empyème*, in the Dictionnaire des Sciences Médicales.) But perhaps the most remarkable case of this kind on record is that recently published by Dr. Wendelstadt of Hersfield, who underwent the operation of paracentesis for empyema in his own person, thirteen years ago, since which time the wound has remained open, and the fluid has been drawn off twice every day, sometimes so much as three or four ounces daily. Three years ago, being anxious to ascertain the dimensions of the cavity which existed in the thorax, he found that it was capable of containing a quart of warm water. The diseased side is much contracted, and does not move at all in respiration, yet he can blow the flute, and walk faster than many persons who are in perfect health, and for several years he has resumed the active discharge of his professional duties. (Journal der Praktischen Heilkunde, Januar. 1831.)

Various expedients have at different times been contrived for extracting the air out of the pleura, with the view of removing the pressure from the lungs' surface, and thereby facilitating their expansion. A variety of syringes have been contrived for this purpose, and recently M. Laennec has proposed to apply a piston-cupping-glass over the wound immediately after the discharge of the liquid, and to produce a vacuum in the chest more or less quickly, continuously and completely, according to the effects. If this suggestion were to be put in practice, care should be taken to avoid exhausting the air so far as to suck out a portion of the lung through the wound, as happened to the writer of this article, when trying the efficacy of the proposed plan on a dog. Another objection to the success of this contrivance is the difficulty of preventing the air from again rushing in through the wound the moment that the exhausting glass is removed.

After all, it appears very doubtful whether the admission of air into the pleura is really as dangerous as is generally supposed, or whether the quantity of air which is contained within the chest affords any such serious obstacle to the expansion of the lung, that its removal may not be safely entrusted to the power of the absorbents; as the experiments of Nysten, and more recently those of Speiss, (De vulneribus pectoris penetrantibus,) have fully proved that air introduced into the pleura is invariably removed by absorption in the course of a few days.

In those cases where the introduction of air produces an unhealthy discharge from the wound, the practice of using injections may be had recourse to with advantage for the purpose of correcting the morbid action of the suppurating surface, and removing the putrescent qualities of the discharge. Willis relates a remarkable instance of the efficacy of injections in such cases. The fluid drawn off at the time of the operation was perfectly inodorous, and continued free from smell for the first three days; after which, whenever the wound was opened, a smell, which he describes as "odor teterrimus, cloacæ cujusvis maxime putentis fœtorem superans,' infected the whole chamber; but by the repeated use of injections, the horrible fetor of the discharge was entirely corrected, and the patient ultimately recovered. (De Empyemate, p. 98.) M. Freteau records another case in which, shortly after the operation, the discharge assumed a dark ichorous appearance, and exhaled a gangrenous smell; but by persisting in the use of injections for twenty days, the matter discharged from the wound assumed a healthy appearance, and lost its disagreeable odour. Willis was in the habit of using a decoction of various aromatics and stimulating herbs for this purpose. MM. Freteau, Billery, and Audouard recommend the decoction of cinchona as less irritating than that used by Willis, and equally efficacious. (Dict. des Sciences Méd. art. *Empyème*.) A weak solution of the chlorate [chloride] of lime will probably be found to act still more efficaciously as an antiseptic. [But it need scarcely be said, that all such applications must be used with the greatest caution, for fear that inflammatory action may be set up, which may not be easily subdued.]

R. Townsend.

ENDEMIC DISEASES.—*Endemic* is a word applied to those diseases which occur among the inhabitants of a particular place or country, in consequence of something local or peculiar in the air, or water, or soil, or in the food and habits of the people. Hippocrates has left a treatise, which, though containing some crude observations, is a model that has been too much neglected by medical writers. His book *De Aeribus, aquis, locis,* according to Haller, is composed in a style, and contains reasoning, worthy of its great author. If we except the Dissertation on Endemic Diseases, by Hoffmann, we have few works written expressly on the subject. Yet it is one which we might suppose would have engaged the serious attention of physicians in all ages.

The knowledge of those peculiarities in climate, soil, elevation, and site of dwelling, and especially in food, drink, and habits; as well as of the moral and physical varieties which are found to coexist with certain forms of disease, in any part of the human family, is a branch of medical science that seems to include some of its essential principles. It is a field that well deserves to be further cultivated; and as we are now becoming better acquainted with different parts of the world by means of more accurate and intelligent observers, it is to be presumed that the data will soon be multiplied, from which, upon comparison of one country with another, many useful practical hints may be deduced, and the real causes of some hidden things in this department of our science ascertained. Of late years, indeed, much to the credit of our professional brethren both in the east and west, many excellent monographs on the medical topography of different places have appeared. An interesting article, pointing out these and other works on the subject, is to be found in the sixteenth volume of the Edinb. Medical Journal, in the editor's learned review of the "Medical Topography of Upper Canada, by John Douglas." But it may be truly said of endemic diseases, generally, in the words of that able review, that "a complete work on the subject is one of the greatest desiderata in our professional literature."

It is needless to expatiate on those things which are obvious to every enlightened observer. As in the body, different effects result from the dry and bracing wind of the mountain, compared with those from the moist and sluggish air of the valley; so, as regards the mind, the observation of the poet is philosophically true,—

> "An iron race the mountain cliffs maintain,
> Foes to the gentler manners of the plain."
>
> GRAY.
>
> "La terra molle e lieta e dilettosa
> Simili a se gli abitator' produce."
>
> TASSO.

But as the physical effects are liable to be varied by climate, elevation, temperature, winds, and the vicinity of wood and water, as well as by the quality of food and drink and the habits of life; so the moral effects (if not indeed also the physical) may be varied by the state of liberty or oppression, of sloth or activity, of comfort or wretchedness, of cleanliness or filth, of mental apathy or cultivation, in which our fellow-creatures in any part of the world may happen to be placed. From all these controlling circumstances need we wonder that diseases should assume such varied appearances? or that many who are living together in the same community, and even born on the same soil, should escape some of the evils to which their less fortunate neighbours are liable? If such escape, there is less cause to wonder that entire strangers should escape also. This in fact is often the case. And when the inhabitants of any particular country or place are especially liable to some form of endemic complaint, they are found to be for the most part exempt from other serious affections. It was a proposition of Dr. James Sims, a physician of acute observation, that if a patient on the verge of pulmonary consumption could be taken into a fenny country in the height of the season, so as to contract a severe ague, there would be little doubt of the phthisical symptoms being at once arrested. The natives of a country often become inured by habit to circumstances which very soon exert a dangerous influence on strangers. The marsh miasmata of the tropics are more pernicious to strangers than to the natives. The cold winds of the northern climates most frequently affect the natives of Africa and the Indies with mortal pulmonary inflammations. It is demonstrated in countries which are inhabited by different races of men, as the negroes and Malays, the Americans and negroes, that the same circumstances do not produce the same morbid effects on both classes. It has been frequently remarked that the water of the Seine produces a diarrhœa in every one except the Parisian accustomed to the use of it. The same treatment will not be required for the same diseases, or rather for diseases called by the same name, in different places and seasons, as in mountainous and in low situations, in summer and in winter, in hot and in cold climates, in affluent stations of society and in indigent. Baglivi says that at Rome ulcers of the legs are almost incurable, while wounds in the head heal without any trouble. Cleghorn tells us of an old proverb, that "Minorca is good for the head but bad for the shins." In France it is remarked that ulcers of the legs are more easily cured at Montpellier, and those of the head at Paris. (See Dict. des Sc. Méd. art. *Endémique.*)

Hippocrates and Celsus both remark that obstinate ulcers of the legs frequently exist in those who are affected with enlargement of the spleen. (*Cleghorn,* Op. cit. p. 71.) The cretin of the close gorges of the Vallais loses his stupidity in the dry and sharp air of the high neighbouring mountains, while the brisk mountaineer experiences less of hemorrhage and of acute disease in the heavy and cloudy air of the valleys. (*Virey.*)

It is an old observation that hemorrhages, acute diseases, and inflammatory affections, are more common in dry and elevated situations, especially if these are much exposed to the north wind. The contrary may be expected in opposite situations, where the "plumbeus auster" lends its aid to weaken the body and depress the spirits.

It would undoubtedly be a useful work to trace, on an enlarged scale, a connected outline of the endemic diseases in different countries, with their topography, and the food and habits of the people. But we must regret that the statements or observations (within our reach) that relate to the supposed causes of such diseases, are many of them too loose and partial for scientific generalization. With such materials, all that can be proposed at present is a very general notice of some of the leading well-attested facts belonging to the most remarkable diseases that usually come under this denomination, and for obvious reasons every thing relating to their symptoms and cure must be committed to other articles of this work.

1. **Intermittent Fever.**—No observation is more general than that ague is endemic among the inhabitants of places where marshes abound, and in seasons, as the spring and autumn, when the effluvia arising from them are more active, and the body perhaps more liable to be affected by their peculiar poison. There are few marshy countries, in temperate and tropical climates, in

which intermittent fever is not known. The connection, therefore, between them does not depend on a *limited*, but a comprehensive induction of facts; the truth is abundantly confirmed. Ague, indeed, sometimes appears where the influence of marsh effluvia cannot be traced; and the term *malaria* has been brought into modern use to denote a morbific atmosphere, arising from the soil, capable of producing intermittent fever, in which marsh *miasmata*, properly so called, are supposed not to constitute an essential part. Many facts would seem to countenance this opinion, as well as that which assigns to malaria the production of continued fever under certain circumstances. In the metropolis we have known persons attacked with ague, mostly however of an irregular type, by working in damp cellars. In temperate climates, under ordinary circumstances, the milder forms of the disease appear, and these in the spring, as the quotidian and tertian. The quartan, more obstinate and protracted, usually appears in autumn. In Sydenham's time, and even in that of Fothergill, the quotidian of spring became continued fever in summer; while the *simple* continued fever of summer often changed to a malignant type in autumn. These were simple observations at a time when systematic arrangements had not put physicians in trammels. But now, lest we should be guilty of medical heresy, we must not insinuate that ague can change into continued fever, and non-contagious fever into contagious typhus, either in an individual case or in the course of the year!

It has been commonly observed that the spleen suffers more in cases of protracted intermittents in temperate climates, and the liver in tropical. Nevertheless, Dr. Jackson tells us of enlarged spleen after such fevers in the West Indies: Cleghorn noticed the same in Minorca; and we have the testimony of W. Twining, that this organ is often found diseased from this cause, in Bengal and all the low districts of Hindostan, (Calcutta Medical Trans. vol. iii. p. 354.)

When tropical heat is added to the influence of marsh effluvia, then we have the various shades of intermittent, remittent, and even continued fever, passing sometimes into each other by almost imperceptible gradations, and complicated more or less with bilious symptoms. When intemperate seasons, deficient or unwholesome food, and animal filth, are superadded to the causes above mentioned, and acting upon a condensed population, the highest grades of pestilential fever are often exhibited, as the plague of Egypt and the Levant, the pestilential fever of Spain, and the yellow fever of America and the West Indies.

When marshy land is brought to a very dry state in summer, after long-continued drought, ague is often but little known in the vicinity; but the first heavy shower after the drought will sometimes give rise to it. And on the contrary, in a wet season, while much water is lying upon the marshes, the disease is rare; but in proportion as they become dried to a certain point, the *miasmata* are found to be active, according to the degree of heat, the season of the year, and the state of the population. A certain quantity of moisture, therefore, seems to be necessary upon the marsh, in order that the miasmata may be disengaged; and of vapour in the atmosphere to convey them to a distance; while a superabundance either prevents their evolution, or entirely absorbs them.

Notwithstanding that the notion has been ridiculed by a few, there can be little doubt that currents of air will sometimes waft the effluvia to a great distance, so as to produce intermittent fever in places otherwise healthy; and some facts would seem to show that hills of a certain elevation in the vicinity of marshy grounds have a sort of attraction for the miasmata, and are almost as unwholesome as the plains.* But it is upon a different principle that hilly grounds, in some cases, become more unhealthy than the plains. The British army in 1809 found that the hilly sides of the ravines in Portugal, after heat and rain, exposed the soldiers to a most destructive remittent, while the overflowed swamps below were more than usually free from disease: "and such," says Irvine, "is frequently the case on the lofty ridges of Sicily, when their fiumari, or water-courses, which are ordinarily dry, and used for roads in the summer months, are filled and inundated with sudden torrents of rain. For here the malaria changes its station, and quits the overflowed low lands for the heights of the primitive hills. (Good's Study of Medicine, vol. ii. p. 166.)

Plantations of trees have been known to intercept marsh miasmata, and thus to prevent their injurious effects upon the inhabitants at a short distance; and for the same reason it is found that the site of a dwelling should not be too near such plantations. "It is wonderful," says Dr. Ferguson, (loc. cit.) "to see how near *to leeward* of the most pestiferous marshes, in the territory of Guiana particularly, where these trees abound, the settlers will venture with impunity to place their habitations, provided they have this security; though every one is fully aware that it would be almost certain death for an European to sleep, or even to remain after night-fall, under the shade of the lofty trees that cover the marsh, at so short a distance." (Med. Chir. Rev., Dec. 1821.)

There is something curious and not easily explained in the circumscribed locality of intermittent fever in certain places. Perhaps, if the prevalence of winds and the situation of such places as to exposure and wood and water, &c., were taken into account, the difficulty might be in part removed. A late writer on malaria states, that on the high Dover road, in Kent, not far from Rochester, some of the people living on one side of the road were attacked with ague, while on the other side all escaped.

It is amply proved that marsh effluvia exert far more pernicious influence upon the body during the state of sleep, or even when it is exposed to them in the night air without sleep. It has also been observed, in illustration of the *ague-giving* qualities of the east-wind, that some time, even days or weeks, after an exposure to marsh miasmata has taken place without producing any perceptible bad effect, the casual blowing of the east-wind has at once fixed an attack of ague. Sea-water flowing over marshy ground, *cæteris paribus*, seems to give rise to more pernicious effluvia than fresh water. The bogs or peat-mosses of Scotland and Ireland, on the other hand, do not appear to generate ague.

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* Medico-Chir. Review, vol. ii. p. 591, Dec. 1821; Dr. Ferguson on Marsh Poison. Dr. Robertson fully confirms the observation of Dr. Ferguson, relative to the exposure of the inhabitants of high situations in the vicinity of marshy grounds to the effects of the miasmata. (Med. Repos. vol. i. p. 367.) He knew people to be severely affected by this cause, who had not been for some time without the walls of the castle of Santa Barbara, at Alicante, 800 feet above the sea-shore; while at the same time, persons living on a level with the sea, and exposed to all the sources of marsh miasma, escaped every attack of fever. He considers that the high grounds present an impediment to the free dispersion of the exhalations through the atmosphere.

Dr. [Sir James] Clark, in his late work "On the influence of Climate," states, that with regard to Rome, at the present time, "a certain period of residence in the *malaria site* is necessary, in general, to prepare the body for its attack; and that there is no reason for the fear commonly entertained of a sudden attack of malaria from simply passing quickly through a malaria district." "The German, French, and English artists were more frequently attacked with fever the second or third years of their residence at Rome than the first." But the situation of this city will not bear an exact comparison with that of a pure marshy district.

Seamen, who after a long voyage venture to land on a marshy shore in the height of the season, too often find that if they remain a single night on land they are attacked by the endemic fever almost immediately. Hence it has often happened that vessels coming to a maritime city, on the eve of a pestilential visitation, although with clean bills of health, have been among the first to show signs of disease in some of the crew; and the fact has been eagerly laid hold of to countenance the suspicion that contagion from the vessel gave rise to the distemper; for it need not be told that mariners who have been long at sea are very susceptible of morbid impressions from a vitiated atmosphere on first coming to land in a sickly season.

As a common rule, regular sufficient diet affords some protection against the influence of malaria; and fatigue, low living, debauch, night-watching, and irregularity of every kind, favour its attack. In temperate climates, where these miasmata abound, the practice of over-excitement with stimuli will do less harm than in hot countries.

2. **Bronchocele.**—From the line in Juvenal, "Quis tumidum guttur miratur in Alpibus?" it would seem that the swelled throat was so common a complaint in the Alps in his time, as not to excite any wonder. It is still found in the valleys of the Alps, and in some other mountainous countries, as the Pyrenees, the province of Behar in India, in Derbyshire, &c. It has been observed also in some mountainous parts of Java and Sumatra; but it is rare in Scotland; and Dr. Reeve states that it is very common in Norfolk. Mungo Park observed the bronchocele in different parts of Bambara, in Africa, along the course of the river Niger. Females are far more liable to it than males. The opinion that snow-water is the cause of this complaint appears to be quite unfounded; nor can we ascribe it to the use of water impregnated with calcareous earth. Yet it is probable that air, water, and diet, each contribute something towards the cause. Sir S. Raffles tells us that there is a village near the foot of the Teng'gar mountains in Java, where every family is afflicted by this malady; while in another village, situated at a greater elevation, and through which the stream descends that serves for the use of both, there exists no such deformity.

In the province of Behar in India, there is a district called Tirhoot, (Calcutta Transactions, 1829, and Edinb. Med. and Surg. Journal, No. 106), in which bronchocele is common among the natives: "and a singular circumstance regarding it is, that on a small river of the district it is not uncommon to see a village on each bank, and quite contiguous, the one with scarcely an individual exempt from the complaint, while in the other the inhabitants are perfectly free from it."

Dr. Johnson cogently remarks, (Med. Chir. Rev. vol. vi. p. 422,) "that we observe goitre more abundant in some than in other parts of Switzerland, though the diet is the same. In the valley of the Rhone we see hardly any thing else than cretins and goitres; while in the valley of Chamouny, separated only by the Col de Balme, we see very few of either disease. We trace bronchocele along the whole course of the Rhine, from Schafhausen to Cologne; it gradually decreases as we descend the Rhine; and among those who inhabit the banks and drink the waters of the upper or turbid Rhone (in the Vallais) there are twenty goitres and cretins for one that can be seen on the banks of the lower or filtered Rhone." Taken in connexion with the Rhine, it forms (in his opinion) a strong ground of presumption in favour of the *goitrifactive* influence of alpine waters. Dr. Johnson, however, does not ascribe all the effect to the waters; and he adds, that "English children (who live as well as people in England) cannot be kept long at Geneva without having enlargements of the thyroid gland." He concludes, therefore, that the cause cannot be traced to sour bread, as Dr. Drug imagined, or to any particular article of diet, except water.*

Notwithstanding the foregoing testimonies, the observation of Dr. Mason Good is very important, that at Matlock in Derbyshire he found "a large number of the poor affected with bronchocele, while the rich escaped; and by far the greater part were exposed to all the ordinary evils of poverty. (See Study of Med. vol. v. p. 309.)

Bronchocele has been observed to prevail most in situations where humidity is joined with excessive heat; and it is found to increase in spring, and to diminish in autumn. Upon the whole, a more ample induction is required before the true causes of the complaint can be determined: the probability seems to be that these are not uniform, or, at least, that they are liable to be much varied; and that a peculiar combination of air, food, and water has much to do in causing the complaint.

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* In the work of this able writer and philosophic observer, lately published, entitled, "Tour of Health, &c." he says, "Dr. Bally, a native of a goitrous district in Switzerland, states the following very important fact. Bronchocele appears to me to be produced by certain waters which issue from the hollows of rocks, trickle along the cliffs of mountains, or spring from the bowels of the earth. That this is the case I may instance some families in my own country, Département du Leman, au Hameau de Thuet, the use of whose waters will in *eight or ten days* produce or augment goitrous swellings. Such of the inhabitants of the above village as avoid those waters are free from goitre and cretinism."

3. Cretinism.—This singular compound of mental and physical deformity is found in situations, as in the Alps and Pyrenees, not unlike those which give rise to bronchocele, with which it is sometimes but not always complicated. It was first described by Felix Plater in 1635, who saw it in Carinthia and the Vallais about the time the rickets, with which it seems to be connected, was observed in England by Glisson. Cretinism was observed by Sir George Staunton in a mountainous part of Chinese Tartary. (See Good's Study of Med. vol. v. p. 334.) A race of cretins has also been noticed by Ramond in the south of France, where they are widely extended, under the name of Cagotts.

The large deformed head, the low stature, the sickly complexion, the vacant and unmeaning countenance, the coarse and prominent lips and eye-lids, the wrinkled and pendulous skin, the loose and flabby muscles, are the physical characters belonging to the cretin, which correspond with an almost obscured or feebly glimmering intellect to form one of the most degrading varieties of our species.

According to Saussure, the valleys where cretinism is most frequent are surrounded by very high mountains, sheltered from the currents of air, and exposed to the direct, and still more to the reflected rays of the sun. The effluvia from the marshes are very strong, and the air is humid, close, hot, and oppressive. Dr. Reeve, who has given a very interesting account of this disease in the fifth volume of the Edinb. Med. Journal, says, that "all the cretins were in adjoining houses, built up under ledges of the rocks, and all of them very filthy, very close, very hot, and miserable habitations. In villages situated higher up the mountains no cretins are to be seen; and the mother of one of the children told me, of her own accord, that her child was quite a different being when he was up the mountain for a few days."* It is gratifying to think that the number of cretins is diminishing. [Yet, a recent writer, (*Twining's Account of Cretinism*, Lond. 1843, cited in the Br. and For. Med. Rev., April 1844, p. 514) estimates the number of cretins in Switzerland, who are entirely idiotic, to be 8000. The only cause, which Dr. Guggenbuhl (Twining, *op. cit.*) has found to be constant in all those localities in Switzerland, where cretinism is endemic, is the damp warm air of close valleys among the mountains, where there is no free circulation.]

It is well observed by Dr. Reeve, that "there is no fact in the natural history of man that affords an argument so direct and impressive in proof of the influence of physical causes on the mind, as cretinism. It may be prevented by removing children from the confined and dirty places where it prevails, and nursing and educating them in the higher parts of the mountains." He further states, that the disease is looked upon as belonging to indigence and poverty; for, in every place where he saw cretins, many well-looking persons of both sexes resided, and these were, *without exception*, persons of a higher class in society, who lived in better houses, and could supply both their moral and physical necessities.

The production of cretinism by the bad quality of the air and food, the neglect of moral education, and other evils attendant on poverty, is sufficiently proved by the advantages that have attended the use of those prophylactic rules laid down by Foderé, in his interesting and classical work on bronchocele and cretinism. And the diminution of the number of cretins is ascribed to the draining of the fens, the more healthy situation of the huts, the clearing of the woods, &c., and, lastly, to the progress which has been lately made in education among them. (See Medical and Physical Journal, vol. v. p. 176.)

4. Plica, Trichoma, Plaited Hair. — No mention is made of this disease either by the ancients or Arabians. Whether it first appeared in Poland, in the thirteenth or the sixteenth century, is doubted by authors. Pistorius refers to the first period, Thuanus to the second. Though plica is more frequently observed in Poland and Lithuania (and less so than formerly) than in other countries, yet it is seen occasionally in Hungary, Transylvania, Prussia, Russia, and Great Tartary, as well as in Switzerland, Belgium, and some parts of France. It is, however, considered to be the endemic of Poland. Many marvellous stories are current in relation to this disease, not only about the causes and contagious nature of it, but the danger of attempting a cure. Whatever the disease may have been formerly, as to its violence and general tendency to supersede other morbid affections, in persons constitutionally or hereditarily liable to it, Alibert, De la Fontaines, Baron Larrey, and others have lately thrown much light upon the complaint, and have proved that inattention to cleanliness, and the peculiar habits of the Poles, have much to do with the occasional causes. Dr. Louis Kerckhoffs (see Med. Trans. of the Col. of Phys. Lond. vol. vi.) does not doubt that filth is now the cause of it, united to the constant habit of the lower classes in Poland of wearing long hair, which, in the hottest weather, none of them ever clean or comb, and keeping the head always covered either with a thick woollen bonnet or a leathern cap. To prove that it was not contagious, he inoculated himself and two children from the fluid filling the bulbs of the hair, which he had taken from a boy labouring under the complaint, without any effect. He and the French surgeons had no difficulty in curing the disease, in several instances, by cutting off the matted and filthy hair, and directing the head to be suitably washed. It must, however, be acknowledged that in some families there seems to be such a predisposition to the complaint, that slight causes are sufficient to induce it, and in some cases even strong mental emotions have given rise to very sudden attacks of it. (See *Lorry*, de Morb. Cutan.) Dr. Vicat (see Edinb. Med. and Phys. Dict. art. *Plica*), assigns three causes for this complaint. The first is the nature of the Polish air; the second unwholesome water, for the common people usually drink that which is nearest at hand, taken from rivers, lakes, and even stagnant pools; the third cause is the gross inattention of the poor to cleanliness, for the better class are far less liable to it than those of inferior stations; the inhabitants of large towns than those of small villages; and the free peasants than those in a state of vassalage. Dr. Kerckhoffs confirms the fact that the rich are generally exempt from plica, and that it is seldom seen but among the poor, "who wallow in filth and misery"—(qui croupissent dans la misère.)

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* A curious observation is made by Dr. Akerman on this subject. (See Dr. Thomas' Practice, p. 605.) "Those who inhabit the *deepest and most recluse valleys* are reduced to the *lowest* state of imbecility and idiotism; in those who are *somewhat more elevated* the mental powers are not so completely obtunded; and others, *still more elevated*, and of course less exposed to exhalations, will probably be deformed merely with wens or swellings about the joints, and other symptoms of rachitis. Those who are *nearer to the summits are perfectly exempt* from all these appearances." These facts show a very singular correspondence between degrees of elevation in those mountainous districts, and a graduated scale of disease lessening towards the summits.

5. **Guinea-Worm.** — Plutarch, (Sympos. cap. ix.) states that those who live near the Red Sea are liable to a disease in which small worms, called *dracontia*, are found in various parts of the body. Kempfer observed the disease in the island of Ormuz, in the Persian Gulph, and also in Tartary. According to Welsch, it is known to prevail among the negroes in all the marshy parts of Africa. The worm is a native of both Indies. Dr. Chisholm, who has given the fullest and best account of the dracunculus that we have seen, (Edinb. Med. and Surg. Journal, vol. ii. p. 145,) says that the complaint is not confined to the natives of Africa in the West Indies, and that it is an endemic, and, during a certain portion of the year, an epidemic disease, in the island of Grenada, where he practised. In one estate of this island all the field-negroes, about three hundred, who drank of a particular well, had the disease every year, in the months of November, December, January, and February, for several years, (or from the year 1787, when the well was dug, till 1794, when Dr. Chisholm left Grenada;) and from March to November not an instance of the disease occurred among them. In another plantation the same thing was observed, and after cisterns were made to hold rain-water for common drink, and the wells were filled up, the disease entirely disappeared. The domestic negroes and whites who drank *rain*-water, while the *well*-water was in use, generally escaped. Three infants, from five to seven months' old, to whom their mothers had incautiously given the water of the well, had each a worm in one of their legs; and a domestic negro boy, who in the year 1793 drank of the *well*-water, had several Guinea-worms the same year, *and only that year*. In a third plantation similar facts were noticed; none of the whites on the estate had the disease except one, who inconsiderately or ignorantly drank of the well-water.

Bruce and Mungo Park give a similar testimony respecting the effects of particular wells in Africa; and Dr. Chisholm concludes that "in all countries in which the dracunculus is endemic, the prevailing belief of the people is, that it proceeds from drinking water which contains the ova or the embryo of the animal."

It is a singular fact that the disease is observed to prevail at Bombay and along that part of the coast of India about the same time of the year when it prevails in the West Indies, viz., in the months of December, January, and February. It also appears in many other districts in the Carnatic and Madura, to within the distance of one or two days' journey from the sea-coast. A learned missionary, named Dubois, in a letter to Dr. Anderson, the physician general, states that he has often seen villages in which more than half the inhabitants were affected by it at the same time. The inhabitants of a village who drink water from one well are attacked by the disease, while the inhabitants at the distance of only half a mile who drink water from another well are not affected by it. Besides, the inhabitants living on the shore of the Cavary and other rivers, who constantly drink their limpid waters, are never visited by it; while those who live at the distance of one mile on both sides, and are obliged to drink the saltish water of wells, are all, or the most part, *yearly* exposed to it.

Dr. Smyttam (Calcutta Med. Trans. vol. i.) confirms the observation of Dr. Chisholm and others that "an argillaceous (*and tuffy*) soil, with a considerable impregnation of salt, or percolated by sea-water, is what the Guinea-worm affects." And another fact seems to be pretty well ascertained, both in the East and West Indies, that the worm not only insinuates itself into the body *through the skin*, but that its ova may be conveyed into the system through the stomach, and deposited in the cellular membrane under the skin, where it attains its growth, and at length produces that local irritation which leads to its expulsion.

The fact that those who are affected with the dracunculus rarely suffer from any other disease at the same time, with a few other reasons which appear entitled to little weight, has led some persons, and lately Dr. Milne of Bombay, (Edinb. Med. and Surg. Journal, No. 106,) to maintain the position that the substance which is observed in this disease "is not a worm, but a lymphatic vessel." We cannot take further notice of this opinion, nor is it necessary to advert to the circumstances which led Sir James Macgrigor to conclude that the dracunculus was contagious, as the facts have been explained by Dr. Chisholm on a far more reasonable hypothesis.

The Guinea-worm has been rarely seen in its native state *out of the body*. Nevertheless, the observations of Dr. Helenus Scott of Bombay, (See Medico-Chir. Review, vol. iv. 1823,) and recently those of Dr. Robert Grant, (Edinb. Med. and Surg. Journal, No. 106.) set the question of its independent existence at rest.

6. **Nostalgia.***—The concourse of depressing symptoms which sometimes arise in persons who are absent from their native country, when they are seized with a longing desire of returning to their home and friends and the scenes of their youth, constitutes the disease called nostalgia. Some have considered it peculiar to the natives of Switzerland, because it was often observed in the Swiss soldiers when on foreign service. But, alas! too many instances of this affection occur in the natives of other countries, and evince that it has its source in the very frame and constitution of human nature in every part of the world. Though it might appear that the inhabitants of mountainous countries were more liable to nostalgia than others, yet many instances have occurred in which a removal from the plain to the

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[* It is not easy to see how Dr. Hancock makes this an endemic disease.]

mountain has produced this melancholy. It would seem as if no country were too wild and savage, if but the simplest means of supporting human life were at hand, not to attach the natives to it. Our affections, like the tendrils of the vine, adhere to the objects that are first presented to them, whether animated or inanimate, with so firm an embrace that nothing but violence can break the connection.

Every one accustomed to the variety and beauty of mountain scenery, and capable of feeling intensely the delights of rural manners, can conceive without difficulty the anguish and shock to the physical powers, which is often sustained by those who are thus ardently devoted to their friends and native country, when they have been rudely separated from them.* The Laplander feels the most enervating and listless despondency, when absent from his snowy mountains and frozen lakes. The North-American Indian sighs amidst the festivities and comforts of polished life for the earthy couch in his native wilds, and the free range of his interminable forests. And the poor negro, even if cruel bondage were not his portion, might be expected to utter bitter complaints for the loss of family endearments and of the noontide repose in the sultry retreats of African luxuriance. Many of the ill-fated Africans, it is well known, perish from *suicide* and *dirt-eating* in those polluted and polluting islands, where we cannot say that

> "No fiends torment nor Christians thirst for gold."

Even the hardy and almost unyielding nature of the British seaman, when he has just set foot on his native land after a long voyage, and been *pressed* against his will to leave once more the objects dearest to him in life, has often been subdued by this powerful influence so completely as to be quite disqualified for the duties to which he was called. Within the last forty years, perhaps no country in Europe has afforded so many instances of the overwhelming influence of the disease in question as France, notwithstanding the natural buoyancy of spirit and thirst after military glory for which that nation is distinguished. There was scarcely an encampment during the war in which the skill of the medical attendants was not called forth, assiduously and painfully, to counteract the pernicious effects of nostalgia,—pernicious, and, indeed, often fatal in a high degree, when any other debilitating or depressing powers were applied at the same time, and acting together with this epidemic melancholy upon the young soldier. It was then observed that a slight wound, dysentery, fever, extra fatigue, or a disastrous engagement, hurried multitudes into a state of mortal depression. (See *Percy* and *Laurent*, Dict. de Sc. Méd. art. *Nostalgie.*)

7. **Tarantismus.**—A disease was formerly supposed to be epidemic in Apulia, and only in that part of Naples, which was so called from the spider named aranea tarantula, whose bite was said to be the cause of it. The peculiarity of the disease mainly consisted in the uncontrollable propensity of the sufferer to dance in the most violent manner at the sound of certain music—some affected by one sort and some by another—till copious perspiration and excessive fatigue put an end to the disease, and thus destroyed the effects of the poison. This was the common opinion, and men of science received it as agreeing with matter of fact. Tarantismus affords one of those humiliating lessons which may too frequently be drawn from medical records, on the difficulty of ascertaining facts, and the prevalence of unfounded opinions, even among distinguished physicians. Kircher, Sir Thomas Browne, Baglivi, Boyle, and Mead, have not hesitated to give credit and countenance to the statements relative to the wonderful effects both of the bite of the tarantula spider upon the body, and of the music as a remedy. Yet it would appear that they were all misled by a popular error. The treatise on the tarantula of a physician so eminent as Baglivi, who was himself an Apulian, tended to confirm the delusion.

On the contrary side of the question we have the strong testimony of Dr. Cornelio, a Neapolitan physician, so far back as 1672, of Dr. Serao, an Italian, and of Dr. Cirillo, professor of natural history in the university of Naples, so lately as 1770, besides that of many others since that time. (See Phil. Trans. for 1672 and 1770.) Cornelio says that "all those that think themselves bitten by tarantulas, except such as for evil ends feign themselves to be so, are mostly young wanton girls, who persuade themselves they have been stung by a tarantula, according to vulgar prejudice, in consequence of having fallen by some particular indisposition into this melancholy madness." Dr. Serao has written an ingenious book, in which he has effectually exploded this opinion as a popular error. Dr. Cirillo asserts that, "having had an opportunity of examining the effects of this animal in the province of Taranto, where it is found in great abundance, he finds that the surprising cure of the bite of it by music has not the least truth in it. In Sicily, where the summer is still warmer than in any part of Naples, and in Tunis also, where this spider is found, the tarantula is never dangerous, and music is never employed for the cure of the pretended tarantism. (See Edinb. Med. and Phys. Dict. art. *Aranca.*)

Dr. Laurent, who lived in the kingdom of Naples for a long time as chief surgeon to the French army, says that the bite of the tarantula does really cause a slight inflammation, but that tarantism, as described by authors, no longer exists. He has often seen, at Naples, ten or a dozen young girls running about the streets, each having a small tambour, and performing with a kind of violent effort, accompanied by the most wanton gestures, the dance they call tarantella, a national dance from time immemorial known in that country. Hence, Mérat thinks it is probable that tarantismus, *the disease*, is nothing but tarantella, *the dance*, adorned with some fables. Nollet, an eminent physician, was satisfied, when in Italy, that the vulgar notion was unfounded; that, even in Apulia, sensible people gave no credit to it; and that it was only some of the very lowest class, who, pretending that they were bitten, *appeared* to be cured by dancing and music, in order that they might gain a subsistence by this kind of imposture. We are assured that the opinion of all the physicians of the country is that the bite is harmless, if not aggravated by improper applications; and that they consider the pretended tarantism arising from it as visionary. Baglivi himself admits that "that spider is only venomous in the *dog-days*, and in very hot situations, for, *at other times*, and *in the mountains*, and *in other countries, it is not so.*" This is a remarkable concession.

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* The celebrated Swiss air called Rans des Vaches, imitating the full rebounding echo of the Alpine herd amongst the mountains, might well awaken mournful recollections in the bosom of the absent soldier, so as to require that the playing of it should be prohibited under a severe penalty

The fact is, that the inhabitants of Apulia, breathing a hot and dry air, are liable to inflammations of the head and chest, and to spasmodic affections; and sufficient grounds appear for considering the aggregate of symptoms, called tarantismus, as a nervous complaint, incident to a people naturally choleric, ardent, impatient, liable to insanity, fond of a dance of which violent gestures constitute a peculiarity, and easily affected by music. (Dict. des Sciences Méd. art. *Tarantisme.*)

Besides the diseases above noticed, some others are classed with endemics, as beriberi, attributed to the alternation of extreme heat in the day with cold and damp in the night; ophthalmia, in Egypt, to solar heat and an adust air imbued with impalpable sand; elephantiasis, in the same country, to corrupt water and the use of salt indigestible food amongst the poor, added to the filth in houses and persons; pellagra, in Milan, and a species of lepra, in Asturia, to bad food and sordid habits also; framboesia, or yaws, in Africa, and among the negroes in the West Indies; tetanus and trismus in tropical climates, east and west; the Barbadoes, or Cochin leg, &c., to causes not well ascertained. Respecting each of these some interesting facts might be stated; but we have only room for a few general observations.

In the first place, we may remark that abject poverty is the soil in which most endemic diseases spring up in every country. Upon the poor, ill-fed, harassed population, living in closeness and filth, these diseases commonly fall, while those who live well and are but little exposed to the injurious qualities of air, soil, and water, are in great measure exempt. Secondly, if we may form any just idea of the causes of physical evils in general, from a consideration of the means which have been found useful in preventing them, then it is clear that, although some complex appearances and seemingly contradictory facts enter into the catalogue of assigned causes of many endemic diseases, so far as they appear to depend on air, soil, food, and drink; yet, on the other hand, proper attention to these things is found, in almost every instance, to be effectual in suspending and finally removing the maladies in question. By draining marshes and cultivating lands, by providing plain sufficient food and wholesome water, with airy dwellings for the poor, it cannot be doubted that a host of physical evils would be avoided. Thirdly, had we time to pursue this subject further, there is wide scope for reflection on the duties which devolve upon the rich in every country to relieve the necessary wants and sufferings of their poor neighbours; on the provision which is made in the nature of things, by a bountiful Creator, for the relief of human misery, in every climate and in all situations in life, if man himself, or at least those who are in power, would but apply the means—if luxury would make a small sacrifice of self-indulgence to the public good; and, lastly, on the physical blessings that would result from this wise paternal care, not only comforting and rejoicing the poor objects themselves, but enriching their benefactors, causing the face of nature to smile around them, and giving them the never-failing reward of sound policy and of Christian benevolence.

T. Hancock.

ENTERALGIA. (See Colic.)

ENTERITIS. This term has been long used in medicine to express an inflammatory state of the intestines, but it is only within our own time that pathologists have attached any definite meaning to the expression. In the other books we read of *gastritis*, *peritonitis*, and *enteritis*, of which latter Cullen describes two species, the phlegmonous and erythematic; and it is remarkable that by a species of consent among medical men the term has been chiefly used to express the first of these species, or the acute inflammation of most if not all the coats of the intestine. But modern researches have greatly extended our views of enteritis, although the true pathology of the intestine is not yet sufficiently recognised by most practitioners.

Enteritis is now known as a disease perhaps the most protean of any of the affections of the body; occurring with every variety of intensity, from a slight and circumscribed vascularity to the most extensive disorganization; simulating by its numerous sympathetic irritations many of the diseases of the nervous, respiratory, circulating and genito-urinary systems; accompanied by the most violent symptoms of irritation, or only pointed out by a profound adynamia; or, lastly, advancing with perfect latency to incurable disorganization. A formidable disease in its idiopathic form, its supervention in the course of other affections is a matter of daily occurrence, and in one particularly, (fever,) a common cause of its fatal termination. We shall dwell on this part of the subject hereafter, and endeavour to show that the enteritis of typhous fever is more a consequence than a cause of the disease, but still not the less important in its prognosis and treatment. Compared with other affections, both acute and chronic, the frequency of intestinal disease must strike every observer. Andral, who, from his vast experience, and the fact of his having no theory to defend, is the best authority on this subject, declares that in the great majority of acute diseases of other parts, a derangement either in the functions or structure of the intestinal canal will occur; and that in chronic diseases, whatever be their nature, it is extremely rare that the digestive tube escapes alteration. These complications of course form part of our subject, but here we shall merely remark that it is difficult to estimate the benefit which Broussais has conferred on medicine by calling the attention of pathologists to the frequency and importance of irritations of the digestive system; and if, in the ardour of discovery, this great physician has in one instance passed the bounds of strict induction, the error is more than atoned for by the extensive good of which he is the undisputed author.

We shall here treat of the different inflammatory affections of the intestinal canal, from the pyloric end of the duodenum to the rectum, reserving the consideration of gastritis and peritonitis for separate articles.

We recognise inflammatory affections of the digestive tube by the alterations of function, the local phenomena and the sympathetic irritations which occur. The general symptoms may be enumerated as follows: indigestion, anorexia, vomiting, thirst, jaundice, tympanitis, constipation, alteration of the fæcal discharges in quality or quantity; pain, tenderness on pressure, contraction of the features, morbid state of the tongue, dryness of the skin, and conjunctiva; suppression of urine, sighing, stupor, delirium, headach, prostration, accelerated and thoracic respiration, fever.

We shall find that the greatest variety in the combinations of these symptoms may occur, principally arising from the following circumstances: —the intensity and extent of the inflammation;—the situation of the disease, both as to the different parts and tissues of the tube;—the complications with other diseases;—the different degree of excitability of the nervous system in different individuals. Thus, when the inflammation is extensive and severe, occupying both the stomach and intestines, we may have the worst forms of bilious or gastric fevers; when it occupies the duodenum, jaundice is a common symptom, and the disease may occur with or without fever: in the small intestine a slight inflammation is often nearly latent, or only pointed out by a little swelling or pain, while in the cæcum or colon the disease produces all the varieties of diarrhœa and dysentery. When the upper portion of the tube is engaged, constipation is a common symptom; when the lower, the reverse takes place. If the mucous membrane alone is engaged, pain and costiveness are often absent; but when all the coats are in a state of acute irritation, we may find the most violent symptoms of peritonitis and ileus, with contractions, intus-susceptions, &c. The complication of the disease with other affections also produces great varieties. Thus when it occurs in the advanced stages of phthisis, diarrhœa is often the only symptom; or when complicated with erysipelas or pneumonia, its most prominent indication is an extraordinary prostration. The different degrees of excitability of the nervous system cause the greatest irregularity of symptoms: in the child, acute enteritis is commonly mistaken for inflammation of the brain; in the adult a circumscribed irritation will in one case be accompanied by violent delirium, while in another, more severe, this symptom shall be completely absent.

We have already spoken of the great frequency of abdominal irritations occurring alone, or in combination with other affections. This knowledge is the discovery of our own time, and may be looked on as the greatest improvement in modern pathology. The humoral school could see in most digestive derangements nothing but the accumulation of sordes: and hence the emetic and purgative practice, in cases where a decided inflammation existed in some part of the tube. They never thought of treating inflammatory diseases of the abdomen as such, unless when they occurred in the highest degree of intensity, involving all the coats of the intestine; and of the nature and symptoms of irritations affecting the mucous system they were almost wholly ignorant. The followers of Brown, on the other hand, saw in these affections only debility, because most of them are accompanied by prostration of strength, functional injury, a weak pulse, and in some cases by completely typhoid symptoms. Ignorant of the fundamental law of pathology, that local excitation or inflammation may coincide with a diminution of the general vital force, they prescribed stimulants, which only increased the debility by exasperating its cause. The progress of medicine has shown, that to various modes and shades of irritation of the gastro-intestinal surface, a great number of affections, the nature of which was previously obscure, are to be referred. We now know that many cases of what has been called idiopathic fever are of this nature, and that it is a common source of dyspepsia, hypochondriasis, jaundice, hepatic obstructions, and tympanitis; that diarrhœa and dysentery constantly arise from it; and that in very many cases ileus, constipation, infantile remittent, tabes mesenterica, melæna, and hæmorrhage from the bowels, are results of this morbid state. To this cause also may be traced many of the irritations of other systems: it may produce hysteria, epilepsy, tetanus, mania, cough, and accelerated breathing, palpitation, suppression of urine, dropsy, rheumatism, and disease of the skin.

We shall endeavour to study the history and symptoms of enteritis separately from those of gastritis, as far as this is possible; for in many cases the coincidence of the two affections prevents this analysis. We shall examine first, the

Acute and Chronic Enteritis of the Infant; and, secondly, these affections in the adult. Enteritis may be an intra-uterine disease; and it appears probable that many of those infants who continue in a state of debility and marasmus from birth, have really been born with this affection. In some infants who have died but a few days after birth, unequivocal marks of chronic inflammation of the intestine have been found; and in others who have lived but two days, the various appearances of more acute irritation have been observed. These facts render it probable that the delicacy of infants may often be owing to this cause, and should render practitioners much more cautious in the use of the tonic, stimulant, and purgative treatment.

During the period of lactation, infants are extremely subject to inflammation of the mucous membrane of the intestines—a circumstance attributable to the high degree of susceptibility which the tube is endowed with, and the great activity of the digestive function; and in most countries also, the irregularities of diet, and the frequent use of stimulants and purgatives powerfully aid in producing this result.

Enteritis may occur in the infant under two principal forms: in the first there is absence of fever, and frequently of the other sympathetic irritations, the symptoms being merely local: in the second we have the local symptoms, but with fever and signs of irritation in the nervous and respiratory systems. The first form is that to which the youngest infants are most subject, the second being more liable to occur as the child advances in age. As in the adult, the symptoms vary with the portion of the tube affected, and in the youngest children they are most commonly those of gastritis and enteritis. Vomiting, diarrhœa, tympanitic swellings and pain on pressure are the most common symptoms of this disease. The tongue is most generally dry, furred, and red at the tip, and the skin dry; and when diarrhœa exists, an erythematous redness round the anus has been observed. Fever may or may not be present, and it often happens that the abdomen feels preternaturally hot. Towards the fatal termination of the disease the skin becomes cold, wrinkled, rough, and of a dirty appearance; the emaciation is extreme, and the muscles are soft and flabby. The character of the face is remarkable; the hollow cheeks, corrugated forehead, and retracted mouth, giving to the child a melancholy and singular expression of age and suffering.

Dr. Abercrombie describes this disease in children of from six to eight months old, and states that in its early stages it is difficult to distinguish it from the ordinary bowel complaints of children at the period of dentition. He relies principally on the occurrence of fever, but we have seen that in the very young child this is insufficient, the symptoms being merely local. The following is his account of the symptoms:—"The infant is usually hot and restless in the early stages, with thirst; and the tongue is dry, or covered with a brownish crust; there is in general a good deal of screaming and fretfulness, disturbed sleep, frequently vomiting, and in many instances pressure on the abdomen appears to give uneasiness. The bowels are loose, but this is not in every case a prominent symptom, for even in the advanced stages the bowels may not be moved above three or four times in the twenty-four hours, while the disease is advancing rapidly to a fatal termination. In other cases, however, this symptom is more urgent, the evacuations being preceded by much restlessness and appearance of pain, and the matters evacuated are sometimes discharged with a remarkable degree of force, so as to be propelled to a considerable distance. The evacuations vary considerably in appearance, and I have never been able to satisfy myself that any reliance is to be placed upon them in ascertaining the disease. They sometimes consist chiefly of a reddish-brown mucus, sometimes of a pale clay-coloured matter, and sometimes of a dark watery fluid; but in many cases they show little deviation from the healthy state, while in others their appearance is evidently disguised or modified by articles of nourishment, which pass through nearly unchanged. The disease often goes on for some time without exciting alarm or being distinguished from an ordinary diarrhœa, until attention is suddenly directed to it by the occurrence of constitutional symptoms. These consist in some cases of a great degree of febrile oppression, with dry crusted tongue, thirst, and vomiting; in others, of a very sudden and rapid exhaustion of the vital powers, which is unexpected, and not accounted for by the frequency of the evacuations; and sometimes the first appearance of unfavourable symptoms consists in the occurrence of coma, with a peculiar hollow languid look of the eye, and a pale waxen aspect of the whole body, while the pulse perhaps continues of tolerable strength. These symptoms may appear while the disease has been going on but for a short time, and while the evacuations have been by no means frequent; while the affection, in short, had not been distinguished from the ordinary bowel complaints of infants." (On Diseases of the Stomach, &c.)

Billard has observed out of eighty cases of inflammation of the intestinal tube in infants at the breast, *thirty* of inflammation of the small intestine and colon; *thirty-six* of the disease in the small intestine alone; and *fourteen* cases of inflammation of the colon. In twenty of the first set there was bilious diarrhœa, and in all swelling and tenderness of the belly: in twelve cases bilious vomiting took place, although there was no gastritis: in all, the erythematous redness around the anus occurred; the tongue was in most cases red and dry, and the skin very hot and arid; but the pulse was rarely excited to any febrile degree, and was frequently feeble. In the thirty-six cases where the small intestine was alone engaged, there were instances of vomiting in twenty; and in fifteen of these latter the disease was situated in the ileo-cæcal region and valve. The belly was in all, at some period of the affection, tympanitic. In twenty-five there was purging of a yellowish matter, and of a substance resembling meconium; the tongue was almost always red, the skin hot, but the pulse little excited. In these cases also the erythema around the anus was generally observed. The fourteen cases of inflammation of the colon were all accompanied with diarrhœa, the tympanitis was much more slight, and in six of the cases only did vomiting take place. There was commonly great agitation, and a remarkable dryness of the skin, which was generally cold and livid. The pulse was scarcely excited. (Traité des Maladies des Enfans.)

From these important observations it would appear that the tympanitis, vomiting, and diarrhœa are the principal signs of the inflammation of the mucous membrane of the small intestine, while in the simple colitis it is most commonly indicated by a diarrhœa, attended with but little swelling of the belly.

The absence of excitement of the pulse in these cases is a point of great practical importance, showing how guarded we should be in any case of intestinal disturbance during the period of lactation. This proposition then appears fully established, that in the infant at the breast fatal enteritis may occur without fever, and commonly without excitement of the pulse.

We must never lose sight of this fundamental principle of diagnosis as applied in particular to the enteritis of children, that *no one symptom is sufficient to point out the disease with absolute certainty.* A child may have vomiting alone, or diarrhœa alone, or colicky pains without enteritis. The occurrence of any one of these with fever is indeed a nearly unequivocal indication of inflammation; but, as we have seen, fever may be absent, and then, as to diagnosis and practice, it is to the group of phenomena that our attention is to be directed. And it should further be borne in mind that although the symptoms of vomiting, diarrhœa, and pain, taken singly, sometimes cannot be connected with a state of inflammation, yet that in most cases they are really owing, if not to this condition, at least to an excited degree of action and irritability which demands the same principles of treatment.

The sympathetic irritations which are most prominent in cases of the enteritis of children, are those of the respiratory and nervous systems. It is of the greatest importance that these should be well understood. It appears that although at first they are not necessarily accompanied by organic changes in the parts, yet that in most cases these will sooner or later occur, and an organ, at first only sympathetically irritated, become at last really inflamed. We may then have a true revulsion of disease, or, what is more common, a new visceral inflammation, in combination with the original disease. The child may then have bronchitis or pneumonia, or arachnitis, or encephalitis, together with the primary enteritis.

We have often seen children who were supposed to be labouring under severe pneumonia, from the great acceleration of breathing and fever, yet on examination by percussion and the stethoscope have found either that no disease existed in the chest, or that there was a slight bronchitis, not sufficient to account for the symptoms. In most of these cases the patients had been treated for pulmonary inflammation, and without success; and with scarcely an exception the symptoms have yielded to the application of leeches to the belly, the use of cold drinks, and the avoiding every thing calculated to irritate the gastro-intestinal surface.

The symptoms of cerebral irritation are more common as a result of enteritis in the child than in the adult. We may observe all the ordinary signs of acute inflammation of the brain, such as pain, delirium, coma, &c., and yet on dissection, this organ be found without appreciable lesion, but the digestive tube highly inflamed; and it is the opinion of some of the best pathologists, that in the infant the most common cause of hydrocephalus is a primary irritation of the digestive tube. On the other hand, we know that symptoms of abdominal disease will arise from an encephalitis; but of the two cases, the former appears to be the more frequent.

There are three affections to which children are extremely liable, the essence of which appears to consist in an inflammatory state of the digestive tube; these are the *weaning brash*, the *infantile remittent*, and *tabes mesenterica*. It is now satisfactorily proved that a diseased state of the mucous membrane is the principal pathological phenomenon in these affections. The study of the symptoms, the history of the exciting causes, and the appearances on dissection, all go to establish this doctrine, which is not new, but by no means sufficiently recognised by medical men. The first of these is manifestly an acute enteritis, produced by the change of food, and in which nature seeks to relieve the inflammation by a super-secretion; and hence the danger of the too sudden suppression of the evacuations, which lights up fever, and is commonly followed by cerebral symptoms. The phenomena of the second are all referable to a less violent irritation, but one which, if not relieved in time, will destroy life with the symptoms of tabes mesenterica, or if exasperated by improper treatment, may run the usual course of more violent inflammation. It may be objected to this view of the disease, that it is often relieved by the purgative plan; but the reverse often occurs, and we constantly meet cases of tabes mesenterica, where the first symptoms were those of the infantile remittent, and in which this mode of treatment has altogether failed. This apparent paradox admits of explanation: where the first symptoms come on in children who have been over-fed, or have used highly indigestible articles of diet, the use of purgatives in the early stages may and does effect a cure by the evacuation of the noxious substances; but there is a period beyond which this treatment cannot be pushed with safety, and if the symptoms do not yield to the use of laxatives, different means must be adopted. These are means calculated to relieve inflammatory action in the mucous membrane, a state, the existence of which is proved by the appearances on dissection, which include all the effects of inflammation on the digestive tube.

The pathology of tabes mesenterica is not yet completely cleared up; but the following circumstances are almost decisive in favour of the opinion that it arises in most cases from chronic enteritis.

First. The mesenteric glands may become enlarged, inflamed, and suppurated in cases of acute and chronic enteritis both in the infant and the adult. *Secondly.* The great majority of cases of this affection have commenced with symptoms of enteritis. *Thirdly.* The dissections of most cases have shown an inflamed and ulcerated state of the mucous membrane. *Fourthly.* The treatment which is found most efficacious is that calculated to remove this condition of the intestine.

It is true that a few cases are to be met with where the enlarged and tubercular state of the mesenteric glands cannot with certainty be traced to enteritis; where in fact the mucous membrane does not present any trace of disease. These appear to be examples of a general disposition to tubercular degeneration of the glandular system, and are exceedingly rare as compared with the others. The absence of vascularity in the mucous membrane may in some instances arise from revulsion, such as would occur from a new and violent inflammation of some other organ; and we have seen cases where it would be attributed to mere anæmia, from the extreme emaciation of the patient. This pathology of tabes mesenterica was first developed by Broussais, in his *Examen des Doctrines Médicales*, in the year 1816, where he declares that the tumefaction of the mesenteric glands arises from enteritis, in the same manner as bubo in the groin arises from chancre. In this disease the fever was attributed to the engorgement of the mesentery, when in fact both of these were secondary phenomena; the true cause was not understood, and hence the uncertain and erroneous treatment of the affection.

As we should expect, this result of enteritis is much more common in subjects of the strumous constitution, or, in other words, in those where the lymphatic system is predominant. Hence the reason of its greater frequency in children, and, when occurring in the adult, in the scrofulous constitution.

Two important facts are stated by the above author in reference to tabes mesenterica; one, that it has been observed to be more frequent during moist seasons; the other, that simple peritonitis will not produce the disease.

[The inflammation of the lining membrane of the intestines of the infant, may vary in character, like that of other mucous membranes, and be *erythematous, pseudo-membranous and ulcerated, or follicular*. The inflammation of the patches of Peyer is often identical, except in intensity, with that of the typhoid affection. The appearance is the same; and, according to MM. Barthez & Rilliet, (*Traité Clinique et Pratique des Maladies des Enfants*, i. 482, Paris, 1843,) "if there be a difference between the two diseases, it must be sought for elsewhere than in the lesion of the patches (*plaques*.)" These gentlemen maintain, indeed, that there are many relations between typhoid fever and enteritis in the infant. The following table is given by them to exhibit the manner in which the different intestinal lesions are combined; and to prove from the diversity of the combinations, that it is useless to endeavour to establish the symptomatology of each anatomical form:

Enteritis (erythematous, pseudo-membranous ulcerated or pustular,	45
Colitis, (of the same nature),	113
Follicular enteritis,	90
Follicular colitis,	64
Softening of the small intestine,	28
Softening of the large intestine,	35

These lesions were associated in the same individual, so as to form the following combinations; 185 being the number of necroscopies:

Enteritis alone,	2
Colitis alone,	32
Entero-colitis alone,	11
Follicular enteritis alone,	12
Follicular colitis alone,	3
Follicular entero-colitis alone,	10
Enteritis and follicular enteritis,	8
Colitis and follicular colitis,	12
Enteritis and follicular entero-colitis,	2
Colitis and follicular enteritis,	17
Colitis and follicular entero-colitis,	11
Entero-colitis and follicular enteritis,	7
Entero-colitis and follicular colitis,	9
Entero-colitis and follicular entero-colitis,	7
Softening of the great intestine,	8
Softening of the small and great intestine,	10
Enteritis and softening of the great intestine,	1
Colitis and softening of the small intestine,	2
Colitis and softening of the great intestine,	1
Enteritis, colitis and softening of the great intestine,	2
Softening of the small intestine and follicular enteritis,	1
Softening of the great intestine and follicular colitis,	1
Softening of the small intestine and follicular colitis,	1
Softening of the small intestine and follicular entero-colitis,	1
Softening of the great intestine and follicular enteritis,	3
Softening of the large intestine and follicular entero-colitis,	1
Softening of the small and large intestine and follicular enteritis,	2
Softening of the small and large intestine and follicular colitis,	2
Softening of the small and large intestine and follicular entero-colitis,	3
Colitis, softening of the small intestine and follicular enteritis,	1
Colitis, softening of the small intestine and follicular colitis,	3
Colitis, softening of the small intestine and follicular entero-colitis,	3
Entero-colitis and softening of the great intestine, and follicular enteritis,	1

ENTERITIS IN THE ADULT.—In describing this form of the disease we find the same difficulty in separating its symptoms from those of gastritis, on account of the frequent combination of the two affections. We still want a series of cases, observed with a view to this particular point, which, however, is not of very great practical importance; for the existence of inflammation being recognized in the digestive tube at any point of its extent, the general principles of treatment are essentially the same.

We have already stated that the symptoms are found to vary with the portion of the tube affected; thus in the following affection the phenomena are often peculiar.

Duodenitis.—This may be an acute or chronic disease, and rarely occurs without more or less of inflammation of the stomach. Hence the term **gastro-duodenitis.** It is now pretty generally admitted that irritations of the stomach and duodenum have a powerful effect in inducing either functional or organic disease of the liver. Indeed, in the opinion of some pathologists, hepatic disease is almost always secondary to this state, a doctrine however which is too sweeping. But it appears certain, that in the notions hitherto received of affections of the liver, the influence of gastro-duodenitis in their production has been greatly overlooked: thus, when jaundice supervenes in the course of a gastro-enteritis, we may diagnosticate inflammation of the duodenum in most cases, and we shall find that to this lesion are to be attributed a great number of examples of icterus. This duodenitis is quite sufficient to produce the jaundice, independent of any mechanical obstruction to the flow of the bile, or the occurrence of an acute inflammation of the liver; and the yellowness appears to arise either from the direct transmission of inflammation along the ducts, or, according to Ribes, by the branches of the porta, or what is more probable, from the sympathetic irritation of the liver, an irritation which will produce a complete jaundice, without arising to the degree of actual inflammation of the organ. This is the doctrine of Broussais; but the fact that many cases of the most acute hepatitis will occur without jaundice, renders it probable that we must seek some other cause than the mere degree of irritation, to explain the phenomenon.

In the third volume of the Dublin Hospital Reports, Dr. Marsh details several cases of this form of jaundice, and insists on the importance of the state of the intestinal mucous membrane. In his cases, the usual cause of the affection was the drinking of cold fluids when the body was much heated, or the sudden and repeated exposure of the surface to cold after a similar state,—causes, among the most powerful in inducing gastro-intestinal inflammation. In there instances, also, the patients were generally ailing for some days before the jaundice occurred, and the symptoms were those of a disordered state of the mucous membrane. The first case detailed presented the disease completely predominant in the digestive tube. This state was pointed out by the symptoms, which were a deeply florid tongue, unquenchable thirst, epigastric tenderness, anorexia, or at other times a canine appetite, great prostration, rapid emaciation, and dysentery. We have seen jaundice apparently connected with an acute inflammation of the gastro-duodenal surface, under two circumstances. An individual is seized, after an excess at table, or other exciting causes, with symptoms of fever with decided indications of an irritated state of the stomach. There is prostration, thirst, general pain, vomiting, anorexia, foulness of tongue, diarrhœa, or constipation. The epigastrium is generally tender, somewhat full, and a dull pain is often felt in this situation. These symptoms may continue for a time, varying from a few hours to several days, when the patient becomes deeply jaundiced. At this time the heat of skin may subside, but the prostration generally continues much longer. By judicious treatment this case generally does well, but if not relieved the affection may be fatal; and in the great majority of cases, death takes place more by an extension of disease through the intestinal tract, or by sympathetic irritation of the brain, than by the production of an acute hepatitis. This appears to be one of the most frequent forms of jaundice; and the symptoms, as to intensity, may vary from a very slight to a severe disease, accompanied with remarkable indications of irritation of the nervous system. Coma is a frequent and most unfavourable symptom; and we have observed delirium and tetanic shocks to occur.

The second case in which we have seen jaundice connected with an inflamed state of the gastro-intestinal mucous membrane, was observed in a good many instances during the last epidemic of fever in Dublin. In the Meath Hospital, Dr. Graves and the writer of this article treated many of these cases, which, from the dreadful severity of their symptoms, and their almost complete analogy with the yellow fever, excited the greatest interest. Of this fatal form of disease, the following description is abridged from the report of the Meath Hospital, printed for the use of the students of that institution.

"In all the cases, symptoms of gastric fever, of greater or less intensity, preceded the yellowness for a few days, and without an exception, the supervention of the jaundice was ushered in by a great exacerbation of the symptoms of gastro-intestinal inflammation. The patient, often without any premonitory indications of the approaching danger, became seized either with spasms of the abdomen, called by the nurses "*twisting of the guts*," a name which agreed singularly with the morbid appearances found after death, or with merely hardness and extreme tenderness of the epigastrium and hypochondria. This hardness, accompanied with a knotted feel of the abdominal muscles, was speedily followed by universal jaundice, general uneasiness, anxious expression of countenance, a hurried pulse, cold extremities, and death, commonly within twenty-four hours from the appearance of the jaundice. About one-half of the persons so affected raved and betrayed great restlessness, while the remainder seemed in perfect possession of their intellectual faculties to the last, but at the same time appeared in a most nervous, irritable, and desponding state of mind. They could not rest for a moment tranquil, but tossed their arms about and looked at their attendants with an expression of suffering and despair. Most of them vomited, and in two cases a matter resembling coffee-grounds was discharged from the stomach and bowels. The tongue was parched, and in some instances covered with a black coating; and in one patient, the attempt to swallow produced general spasms. In all, the most exquisite tenderness of the epigastrium existed; and in several the tip of the nose became purple, giving to the countenance a truly frightful appearance, particularly when it spread from the nose to the upper portions of the cheeks. This change was preceded by pallor and coldness of the part; this was succeeded by a leaden hue, and in twelve or twenty-four hours the purple hue was complete. The toes were in some cases similarly affected; and where the patients recovered, a partial destruction of parts resulted from the disease. On dissection the appearances in all the cases were remarkably similar. The mucous membrane of the stomach and duodenum was found in an intense state of inflammation, which also extended more or less into the small intestines, where numerous recent intus-susceptions were constantly found. The spleen in almost every case was greatly enlarged and softened, but in none did we find evidences of inflammation of the liver, or obstruction of the gall-ducts. Slight yellowish effusion below the arachnoid was found in several cases; and in one there was a remarkable dryness of the arachnoid. Such were the appearances in about fifteen cases of this disease. There were some cases in which general convulsions were reported to have occurred, but we could not corroborate this by personal observations. In every case a general hardness and knotted feel of the abdominal muscles, with extraordinary tenderness of the epigastrium and hypochondria, were observed. This was often so extreme as to make us suspect the existence of peritoneal inflammation; yet on dissection no instance of this lesion occurred. The bad symptoms generally came on without any indication of the approaching danger; the intestinal spasms being speedily followed by general jaundice of various degrees of intensity; and in the fatal cases death took place in a space of time varying from six to twenty-four hours. In every instance the patients suffered from extreme thirst, and there was nausea, and frequently vomiting, and in one case the genuine black vomit occurred for some hours before death."

With respect to the cause of the jaundice in these cases, we are more disposed to connect it with the severe gastro-intestinal inflammation than with any other lesion. Perhaps the violent spasmodic action, by constricting the orifices of the ducts, might have had some effect; but the fact that many of the patients had bilious stools, and our commonly finding bile in the intestines, is against this supposition. That it did not depend on hepatitis is certain, as in no case did we find marks of inflammation in the liver. That the liver in such cases is more or less irritated is probable from the sympathy which it possesses with the gastro-intestinal mucous membrane, but in both cases this irritation is secondary, and seldom amounts to actual inflammation. In one case hepatitis was observed, but the patient was not under our care; and symptoms of suppuration of the liver, with discharge of the matter through the lungs, occurred in one of our convalescent patients. In this case perfect recovery followed. In no instance did any of the attendants of the hospital contract this form of fever; from which circumstance we conclude that the change of character did not increase the contagious nature of the disease.

In this country, where it is so usual to attribute many complaints to affections of the liver, it is of great importance that the connection which commonly exists in the relation of cause and effect, between irritations of the upper part of the digestive tube, and derangements of the hepatic function, should be carefully studied. It is true that gastro-duodenitis may exist without jaundice, or that hepatic inflammation may arise independent of disease in the mucous membrane; but it is equally true that the symptoms of gastro-duodenitis, both acute and chronic, are those commonly received as indicative of hepatic disease; and that this last affection may commence by inflammation in the digestive tube. These principles must be borne in mind; and in the treatment of such affections, if any doubt exists as to the diagnosis, it is better to give the patient the advantage of that doubt; to treat the patient for gastro-duodenitis before we have recourse to the hazardous modes supposed to be useful in hepatic disease. It constantly happens that cases of chronic gastro-duodenitis are treated as disease of the liver. This, if proper practice was pursued, would not lead to any serious injury, as the principles of treatment in both affections should be essentially the same; but where purgatives and mercurials are blindly lavished, without regard to the state of parts or the constitution of the individual, the distinction becomes of no slight importance to the safety of the patient and the character of medicine.

Inflammation of the Jejunum and Ileum.—It is difficult to lay down the symptoms of this affection, from its frequent combination with disease in the stomach and colon; but where the disease is predominant in this part of the tube, the symptoms are generally the following: thirst, often without any vomiting, tympanitis, tenderness on pressure, pain, when present, not severe. In fact, if we abstract the symptoms of irritation at the upper and lower portion of the tube, such as vomiting and diarrhœa, we may have the remaining signs of intestinal inflammation arising from this cause. It would, however, be wrong to conclude that vomiting and diarrhœa always point out an extension of disease to the stomach and colon; the contrary is the fact; but as a general rule the existence of these symptoms should lead us to suspect that the disease is not confined to the small intestines alone.

When the disease is severe, we commonly observe stupor, a red tongue, great thirst, tenderness on pressure, tympanitis, which is often excessive and occurring at an early period of the case, tenderness on pressure principally observable in the hypogastric and iliac regions. Diarrhœa may be present or absent, but the latter is, we believe, the most frequent case. The pulse is generally small and frequent, and the features are contracted. In a case of inflammation of the ileum in its lower third, which lately came under our notice, the abdominal symptoms were great tympanitis, pain on pressure, and thirst, without vomiting. In the commencement of the case there was some diarrhœa, but this soon subsided, and was succeeded by constipation. On dissection, the stomach and colon were found perfectly free from vascularity; but the lower portion of the ileum presented a vast number of extensive ulcerations. In this case, the absence of vomiting and of diarrhœa in the more advanced periods is extremely interesting, as connected with the healthy state of the stomach and colon. We have more than once observed, in examining the bodies of phthisical patients who never had diarrhœa, that the ulcerations and other marks of inflammation were confined to the ileum alone. In the present state of our knowledge it appears, that in cases of inflammation of the ileum, the absence of vomiting and diarrhœa seems to imply a healthy state of the stomach and colon; but on the other hand, these symptoms may occur independently of disease in these portions of the tube.

The symptoms arising from sympathetic irritation vary with the idiosyncrasy of the patient and the intensity of the disease. There may be a violent continued fever, a remittent or hectic fever, or a completely apyrexial state. We have known one case where the most prominent symptom was so violent an excitement of the heart as to lead to the belief that pericarditis and hypertrophy of the organ existed. In the Meath Hospital we have often observed increased pulsation of the abdominal aorta in these cases, a symptom which has not been sufficiently attended to. Here the excited state of the vessel seems analogous to that of the radial artery in cases of whitlow, and may be perceived even where the belly is not collapsed. Under proper treatment this subsides, with the other signs of abdominal irritation.

In the inflammation of the small intestines in the adult, cerebral excitement is generally not so prominent a symptom as in that of the child, nor is it so often followed by structural disease of the brain. It is sometimes very difficult to say whether symptoms of irritation of the brain, under these circumstances, are really indicative of actual inflammation of that organ. Andral relates a case where the patient, aged 35, was attacked with pain of the head, followed by great loquacity and exaltation of ideas, and other symptoms of cerebral excitement. The tongue was natural, and the abdomen *soft and not painful*. He had soon after furious delirium, and indications of strong determination to the head. Copious general bleeding, and the application of leeches to the neck, produced no alleviation; and the patient expired suddenly in the midst of a general spasm. The only local symptom of an affection of the bowels during the disease was a slight diarrhœa. On dissection the brain and its membranes were found perfectly healthy; but the lower third of the ileum was in a state of acute inflammation.

Other instances of anomalous symptoms might be quoted. In many cases the disease is termed simple continued fever, and extensive destruction may be going on without the occurrence of any decided local symptoms. The affection, however, should be suspected, if in addition to the general symptoms there is much thirst, tympanitis in the early stages, and irregularity of the bowels, which are sometimes constipated, or the contrary; the state of the evacuations does not afford much information, as fatal cases have occurred where they continued perfectly natural. It is in these cases that the excess of the system of purgative treatment is so liable to do injury. We believe that many patients are thus lost; ulcerative perforation being induced, or the disease aggravated and extended to the colon. We have also constantly seen the exhibition of turpentine, with the intention of relieving the tympanitis, produce the very worst consequences. As a general rule, this substance should never be exhibited in the early stage of a febrile affection where tympanitis exists. This is the disease described by Petit, under the name of the *entero-mesenteric fever*, of which the following accurate description should be borne constantly in mind. "There is at first a feeling of debility and general illness, with anorexia and irregular attacks of fever, but more often diarrhœa. The countenance is expressive of prostration and dejection; the eye dull, and the skin pale and livid, particularly about the lips and the alæ nasi; decubitus on the back; disinclination to motion; skin dry and harsh; torpor, and a certain degree of prostration of the intellectual faculties. The fever is obscure in the course of the day, but gradually comes on in paroxysms, without rigors or much heat, but with injection of the eye and slight delirium; there is great thirst, the teeth are dry, and the tongue is covered with a greyish paste: the stools are bilious or serous, variable in their frequency or abundance, but not sufficient to account for the prostration of the patient; belly soft and not swollen; little or no pain, but on pressure pain is felt generally on the right side, between the umbilicus and crest of the ileum: there is retraction of the lips and alæ nasi. The symptoms gradually increasing, we observe the cheeks to become livid, the eyes are sunk and injected, and somnolence and delirium become constant, although the answers of the patient, though painful, are correct. Petechiæ, subsultus tendinum, and continued fever, with nocturnal exacerbations, supervene; the pulse is frequent and easily compressed; the teeth are covered with sordes, and the tongue with a brownish or black crust; the belly becomes more painful, the pain being sometimes still confined to its original situation, and without tympanitis, at other times more extended and with meteorism. The alvine evacuations become serous, fetid, and frequent, and the urine is scanty. Excoriations of the nates commence, and where the patient has been blistered there is a tendency to gangrene."

On dissection, the digestive tube is generally found healthy until we arrive at the middle of the ileum, which presents all that class of appearances constituting the *exanthème interne* of the French pathologists, the *dothinenteritis* of Bretonneau.

This disease appears to be a common cause of what is termed an imperfect convalescence in fever. A patient, after suffering from fever for some time, becomes so much improved, that a speedy convalescence is hoped for; but in a few days it is found that strength is not returning, the pulse continues quick, and the appetite, though sometimes restored, is more often deficient and capricious. A degree of stupor comes on, and there is an occasional flush on the cheek. Under these circumstances there is often reason to suspect this disease of the ileum, which may go on insidiously to a fatal termination, or suddenly destroy life by ulcerative perforation. Dr. Cheyne describes these cases in his Report of the Hardwicke Fever Hospital for 1817, from which we extract the following important remarks:—

"In these cases the distress of the patient often bore no proportion to the danger he was in; the former was very little, while the latter was extreme. The disease would proceed without violent symptoms; nay, a patient would seem to be recovering, although without any critical discharge: he would call for full or middle diet, and for days take his food regularly. The only circumstance in his situation which demanded attention was that he regained neither strength nor flesh; he expressed no desire to leave his bed. Then his pulse again became quick and his tongue dry, and he would complain of *dull pain and uneasiness in his belly*, attended with soreness on pressure, and a degree of fulness in the upper part of the abdomen. Then came on a loose state of the bowels and great weakness: probably at the next visit the patient was lying on his back, with a pale sunk countenance and a very quick feeble pulse; his mind without energy. Then the stools (*mucous*) passed from him in bed, and the urine also; perhaps a hiccup came on; next his breathing became frequent, in which case death was at no great distance. Attempts to check the diarrhœa by astringents and opiates, or to rouse the patient by cordials, were alike unavailing; such remedies only seemed to accelerate death."

Dr. Cheyne states that in all these cases the mucous membrane and glands of the intestine were found in a state indicating decided inflammation during life. See also *Andral, Clinique Médicale.*

The history and symptoms of inflammation of the large intestine, *colitis*, are described in the article DYSENTERY, to which we refer.

[A few remarks may be made, however, upon **Inflammation of the Cæcum,** to which great attention has been paid by pathologists, of late years more especially. To this the names *Typhlitis* and *Typhlo-enteritis* have been given. This inflammatory condition has already received some notice under CONSTIPATION, (p. 484.)

Simple acute inflammation of the lining membrane of the cæcum may be an accompaniment of colitis or dysentery; but it may occur independently of these. The most marked symptoms are, violent pain in the right iliac fossa, increased on pressure, by which it is rendered lancinating. The pain is constant, and often proceeds in the direction of the ascending colon. The evacuations are copious and frequent, sometimes from ten to twenty in the day, and are mucous or bloody, or both; and, along with these symptoms, there is generally gastric disturbance and fever, the pulse being accelerated and hard, the skin hot and dry, and the urine high-coloured, as in ordinary cases of severe internal inflammation.

Inflammation may likewise attack the peritoneal coat solely, or along with all the coats of the intestine, and these are the cases to which attention has been mainly directed of late years. They are attended with more or less tumefaction in the iliac region, and are owing to some mechanical impediment in the cæcum, constituting *Typhlitis stercoralis*. Where the disease affects the peritoneal coat, it is marked by the ordinary signs of peritonitis, or rather of inflammation of the peritoneal coat, of which constipation is one. The inflammation may extend to the cellular tissue surrounding the cæcum—*Perityphlitis*—and is indicated by an inflammatory pain in the iliac region with distinct hardness, constipation and numbness of the thigh—owing to the tumour pressing upon the nerves as they pass down to the right lower extremity—and occasionally retraction of the testicle. This form of the disease may terminate by resolution, or in any of the results of cellular inflammation. Pus may form and be discharged into the cæcum, or into the cavity of the abdomen; or perforation may take place through the intestine and the parietes of the abdomen; and where the disease terminates fatally, a large cavity is generally observed in the vicinity of the cæcum, separated from the cavity of the abdomen by the peritoneum. In a case, which fell under the writer's care, the pus was discharged into the urinary organs, and the female recovered.

Idiopathic inflammation of the cæcum from ordinary causes, as from exposure to vicissitudes of weather, is certainly rare. Yet the author has observed three or four cases in which no other cause could be assigned than such as might have induced inflammation in any other part of the digestive tube or of any internal organ.

The symptoms, that indicate typhlitis induced by mechanical causes, are—very decided evidences of local inflammation coming on without any very obvious cause, when the patient is in health; and the comparatively slight implication of the general system, as shown by the greater or less freedom from fever. The pain commences in the very seat of the cæcum; gradually augments for from twelve to twenty-four hours, and is constant. Careful examination now shows fulness and tension of this part of the abdomen, with tenderness on pressure, and dulness on percussion; the bowels are constipated, and the functions of the stomach disturbed. The general system now sympathizes, and the ordinary symptoms of internal inflammation declare themselves. Any motion of the body induces pain, so that the patient lies on his back, inclining towards the right side, with the thigh bent on the abdomento to relax the abdominal parietes. The symptoms go on in this manner for some days, the affection gradually extending, more or less, over the abdomen, which now becomes full and tense. The pain over the cæcum is lancinating, and the slightest touch with the finger, or the slightest covering, excites excruciating torture. Still, the danger does not seem so imminent as in acute enteritis, although in the sequel it may prove equally fatal.

It is obvious, that a favourable termination of a case of this kind cannot be expected until the mechanical impediment yields; but if this be removed, all the symptoms soon vanish. This, however, can rarely be accomplished in less than a week. About this period, it may happen that, if the bowels have not responded to the means employed, the patient's strength declines and he dies; and it has been conceived by one writer,—Dr. Burne,—that if much blood has been abstracted, he may sink rather from exhaustion than from the effect of the inflammation: this, however, is scarcely probable; but if life be prolonged, there may be discovered, about the tenth day, a circumscribed emphysematous tumour in the right ilio-inguinal region, or posteriorily in the corresponding ilio-lumbar region, which is a fæcal abscess making its way to the surface. If in the former case, the peritoneum must be perforated after adhesions have been formed around the part to be perforated; if in the latter, the abscess tends upwards and backwards towards the least resisting part of the lumbar parietes, which is at the outer edge of the quadratus lumborum muscle. In this way, the abscess may be discharged, and recovery take place, or the patient may die worn out by irritation.

Perforative abscess of the cæcum must be esteemed a serious malady. Of seventy-three cases, death occurred in twenty; and in eleven others, the symptoms were so severe as to threaten life. Stercoraceous abscesses appear to be the most fatal, the ratio being five in seven, according to M. Grisolle.

Inflammation of the Appendix Vermiformis Cæci.—The appendix vermiformis, the use of which is so obscure, and its presence even by no means indispensable, communicating, as it does, with the cæcum by means of an open extremity, may have substances impacted in it, which give rise to inflammation and perforative ulceration, attended with fatal consequences; for although adhesion may take place between it and the peritoneum lining the parietes of the abdomen, the more common result is for the abscess to break into the cavity of the peritoneum, and to induce fatal peritonitis.

The symptoms which indicate this affection are by no means diagnostic. Generally, there is a deep-seated pain in the cæcal region, with more or less fever, vomiting and obstinate constipation. The pain is aggravated by pressure; and careful examination exhibits tumefaction, which may be unhesitatingly referred to the cæcum or to its appendix; at other times, the inflammation spreads over the whole of the peritoneum, so that the diagnosis, when the physician is first called, may be—peritonitis, general or partial.

The position of the appendix is not always the same; a fact which must be borne in mind. Generally it is curled up beneath the cæcum, concealed by it, and on the outer side of the psoas magnus muscle; and, according to its position, different parts in its vicinity may be prominently implicated.

It has been already remarked, that the affection may be induced by small substances becoming impacted in the appendix. In one instance, it was an intestinal concretion; in another, a pin, encrusted with a calculous deposit; in another, a cherry-stone; in another, a grape-stone; and, in another, a tooth, which had been swallowed.

The appendix has been found perforated—a portion having sloughed away—with evidences of a high degree of mischief, the result of inflammation; as effusion of coagulable lymph, suppuration, or gangrene, in the neighbouring parts.

Inflammation of the Colon.—This, like inflammation of the rest of the intestinal canal, may affect either the peritoneal or the mucous coat. When seated in the latter, we have the phenomena of dysentery. (q. v.)

When the peritoneal coat is inflamed, there may be constipation, and the usual signs of exo-enteritis, except, that the mischief is referred to some part of the colon,—the ascending, transverse or descending portion, and that the affection of the general system is much less than when the same pathological condition is seated in the small intestine. The nearer, too, the inflammation is to the rectum, the less acute and violent is the disease. When in the transverse colon, it is often extremely obscure. Commonly, there is considerable pain upon pressure, with more or less distension of the colon, meteorism, constipation, vomiting, great restlessness, along with the signs of internal inflammation.

When colitis passes into the *chronic state*, we may have all the results of chronic inflammation of the peritoneal surface of the small intestines,—adhesion of the colon to other viscera, thickening of the parietes of the intestines, with diminution of the caliber,—at times, to such a degree as to occasion obstruction, and death, &c. &c.

Many morbid conditions, that are referred to the stomach or liver, have their seat in the colon. Owing, too, to the attachments of the colon, and its immediate proximity to several important organs, its unequal distension and frequent changes of position, various sympathetic affections are induced, the nature of which is often misunderstood.]

The foregoing view of the symptoms of inflammation of the mucous membrane of the intestine will suffice to give a general idea of the disease, of which, however, there are many other modifications. To enter more fully into these would occupy too much space, and hence we shall pass at once to the consideration of the pathological anatomy of the digestive tube. Now, in order properly to estimate the morbid, it is necessary, in the first instance, to take a view of the healthy condition of this organ.

It is now demonstrated that a great variety of shades of colour may exist in the mucous membrane, independently of any diseased action whatsoever. The situation of the part, the age of the patient, the process of digestion, and the length of time after death, will all modify the colour of this tissue. Its natural colour, however, may be stated to be greyish-white in the duodenum and jejunum; the greyish tint diminishes to the end of the ileum, and in the large intestine the colour is white. This may serve for a general description. When we examine the intestinal mucous membrane of the fœtus, we find it of a rosy colour, which diminishes after birth; in youth, the white colour becomes gradually less vivid; and as the individual advances in age, the greyish tint becomes manifest.

The mucous membrane, however, is seldom met with so slightly coloured, and when we speak of the value of redness as a sign of disease, we shall examine the various sources of this change of colour.

In the state of health the gastro-intestinal mucous membrane varies in its thickness, according to the part of the tube examined. Billard has described it as most thick in the duodenum, and the thickness as diminishing in the following order of parts: the stomach, rectum, jejunum, ileum, and colon, where it is thinnest: it is obvious, however, that unless the increase or diminution of thickness be considerable, its value in a pathological view cannot be great; and, independent of intestinal disease, it may present appreciable differences. Thus, in cases of great emaciation, the atrophy of the membrane is often extreme, while in examples of mechanical congestion its thickness is frequently much increased. Louis has attempted to determine the exact depth of the mucous membrane by measurement; but this is a mode not applicable to general use. As to its consistence, this is stated to be in the direct ratio of the thickness; hence, if in those situations where the membrane has naturally the greatest thickness, we find its consistence only equal to the thinner portions, it is plain that from some cause this has been diminished. It is difficult to meet with cases on which to try the accuracy of this assertion. We have been led to doubt it more than once, but the impediments to the investigation are very considerable; the greatest experience is required to enable us to decide on the healthy consistence of the part; and we seldom meet with the tube free from some active or passive congestion: add to this, that many other circumstances cause variations in the cohesion of the membrane, such as the presence of liquids in the tube, putrefaction, atmospheric heat, and a fluid state of the blood. The mucous follicles have lately attracted the particular attention of pathologists; and to their inflammation several remarkable disorganizations may be referred. Thus, in very many cases of intestinal ulceration, the destructive process seems to be primarily seated in these glands. Bretonneau has indeed described a peculiar disease, called by him *dothin-enteritis*, consisting in an inflammation of these glands alone; but it is still to be shown whether this disease in reality differs from other examples of intestinal inflammation. In these countries the writings of Drs. Hewett, Bright, and Abercrombie have contributed to draw the attention of physicians to these glands.

We find these bodies, in the state of health, most developed in the duodenum and stomach, and in some cases also the glands of Peyer are observed distinctly in the small intestine. This is more remarkable in children, but still their enlargement alone in the adult must not be considered as an unequivocal indication of former or actual disease.

Lastly, we have the sub-mucous and sub-serous cellular membranes, and the two orders of muscular fibres, in which tissues disease may produce a great increase or diminution of volume. The muscular fibres are compared by Andral to the muscles of white-blooded animals, and are found strongest at the pyloric portion of the stomach and in the rectum. This tunic of course appears thicker where the intestine is contracted, and like the heart, may become atrophied in cases of general emaciation. We often, indeed, meet with cases where the demonstration of these fibres is a matter of great difficulty.

The natural condition of the intestine is a collapsed but pervious state. Dr. Abercrombie, in his theory of ileus, holds that the cord-like contraction is the normal condition of the part; but in this opinion he is completely singular: contraction of a muscle implies the communication of a stimulus, and cannot be considered as its natural state.

But the consideration of these tissues alone will throw little light on the physiology or pathology of the intestinal canal, if we do not take into account that its surface presents a prodigious vasculo-nervous expansion, where, in a manner analogous to the retina in the eye, or the portio mollis in the internal ear, the (sentient) extremities of the organic nerves, and to a certain degree of those of the life of relation, are extended. It is, to use the words of Broussais, an internal sense, and thus can be understood its numerous sympathies in health and disease,

There is no organ in the body where the determination of the value of morbid appearances is so difficult, and hence it is necessary to investigate a great number of circumstances before we can say whether the mucous membrane has or has not been in a state of disease.* In general these difficulties are not sufficiently estimated; and it is to be regretted that one class of pathologists are too hasty in ascribing every change from the physiological condition to a process of irritation; in these countries, indeed, vascularity alone is too often taken for an unequivocal indication of the previous existence of inflammation, a circumstance which invalidates many of our accounts of morbid changes in the digestive system. We shall see that vascularity alone, in all its forms, does not prove the previous existence of inflammation; and that, further, the converse of the proposition will sometimes be found to be true. It may be laid down as a general principle, that no morbid appearance whatsoever, taken singly, is a certain proof of the occurrence of inflammation. Even ulceration, perhaps the most certain of all, may occur under circumstances in which it is difficult, if not impossible, to trace it to an inflammatory origin.

The following are the results of inflammation on the intestine:—1. Increased vascularity, or hyperemia. 2. Increase or decrease of development. 3. Induration, or softening. 4. Ulceration 5. Change of secretion in quality or quantity. 6. Alterations of sensibility.

Vascularity.—The great principle to be recognised in determining the value of this condition, as a proof of inflammation, is, that there is nothing in its intrinsic characters sufficient to point out the nature of its origin. Many authors have described certain kinds of injection indicative of active or passive congestion; but the researches of Andral have shown that the distinctions relied on are by no means certain, and this also is the result of our experience. By a careful examination, however, of the concomitant circumstances, we shall, in most cases, be enabled to decide the question. Capillary injection, putting aside some of its rarer sources, may generally be stated to arise from one of the following causes:—1. active irritation; 2. congestion from abstraction of the venous circulation; 3. congestion from position. We may compare, by opposite characters, the inflammatory and non-inflammatory redness.

Inflammatory redness.	*Non-inflammatory redness.*
1. Occurring indifferently in the depending or non-depending portion of the tube.	1. Most distinct in the depending position.
2. General injection rare.	2. General injection common.
3. Without venous obstruction.	3. Commonly arising from obstructions in the porta, heart, or lungs.
4. Sometimes slight and local.	4. Generally occupying a large portion of the intestine.
5. With softening of the submucous cellular membrane.	5. Without much softening.
6. With alterations in the quality or quantity of mucus.	6. Without these alterations.

By means of this table, which, with some alterations, is taken from the work of Billard, we may in most cases determine the nature of vascularity occurring in the intestinal mucous membrane. The presence or absence of ulcerations, of fungoid elevations, of lymph, the state of the submucous follicles, the occurrence of thickening, and, lastly, the history of the case, will aid further in deciding the question. It has been remarked that the active and passive congestion differ in the circumstances of their formation; in the latter the injection proceeds from the large vessels, which are first distended to the capillaries, while in the former the reverse takes place. This may be a test in the earlier stages of the process.

From the consideration of the different causes of redness in this tissue, it would appear that before we conclude that vascularity in any case is an unequivocal sign of inflammation, we must in the first instance inquire whether it is not the result of the process of digestion; *secondly*, whether it may not be owing to a fluid state of the blood, as observed by Morgagni; *thirdly*, whether it arises from putrefaction, exposure to air, or the depending position; *fourthly*, whether it is the result of the congestion which occurs immediately before death in tissues abounding in vessels; *fifthly*, whether it is caused by obstructions in the aorta, heart, lungs, cava, or vena porta. Other causes of redness, independent of inflammation, are noticed, but they are not of great importance, except in the case of a patient dying in the cold stage of intermittent, where the viscera are found loaded with blood. These considerations show the difficulties that exist in the decision of this question, and should make us doubt the reports of inflammatory appearances in the digestive tube, unless made by the most experienced pathologist.

The shades of colour which are produced by a process of irritation are very numerous, but may be reduced to modifications of red, brown, slate-coloured, and black; of these, the first is most commonly, though by no means universally, the product of an acute inflammation, while the three last are nearly exclusively the result of a chronic process, in which the colouring matter of the blood, variously altered, becomes incorporated with the tissue of the mucous membrane. Of the red colour, Billard enumerates six varieties, viz., the ramiform and capillary injection, the punctuated and striated redness, that occurring in patches, and, lastly, the diffuse. Bearing in mind that all these may be the result of other causes besides irritation, and that we must look to the concomitant circumstances to decide upon their nature, we must admit, with the author just mentioned, that the first of these, consisting of a very slight injection, must be the result of a feeble irritation, one to which the flux is by no means considerable. In the second species the injection is finer and closer, and points out a much higher degree of irritation. This is often seen in the neighbourhood of ulcerations. The punctuated redness is less common in the intestines than in the stomach; its appearance may be compared to that produced by finely sprinkling a surface with red paint, and it does not point out an intense degree of irritation. As to the striated redness, we have most usually found it in cases of chronic enteritis, where, for a considerable length of the tube, the prominent edges of the valvulæ conniventes were of a deep red colour, giving to the intestine the appearance of circular stripes. It sometimes coincides with a puriform secretion and an indurated state of the submucous cellular tissue. The last two species are the most important; here the vascularity is intense; so much so as to obliterate the traces of the capillary vessels, and give to the membrane a continuous blood-red colour. They may both be the product of an acute or chronic inflammation, but generally arise from the first cause. The diffuse redness is sometimes found of great extent, and points out a most severe disease. We have often seen the mucous membrane, in such cases, exactly similar to the conjunctiva of the eye-lids in the worst forms of purulent ophthalmia. This appearance was found in most of that singular set of cases, greatly resembling the yellow fever of warm climates, which were observed at the Meath Hospital during the late epidemic of fever. It is the result of the highest degree of idiopathic inflammation; it is no longer an injection, but an active ecchymosis.

The brownish, slate-coloured, and black appearances of the mucous membrane are generally referred to a very chronic irritation. The last, indeed, is most commonly seen in cases of diarrhœa of long standing, and occurs with other indications of a profound morbid action. It is, however, seen in some cases of a high degree of acuity, as in instances of corrosive poisoning, and in the yellow fever and dysentery of tropical climates. This is important, as connected with the opinion of Broussais, where, in speaking of the black colour of mucous membranes, he holds that in most of these cases an acute had preceded the chronic state.

An important question here arises—do these appearances of inflammation always furnish an accurate measure of its intensity. We have seen that there are circumstances foreign to irritation that may increase this vascularity, such as position, mechanical impediments to the venous circulation, &c. Hence, in certain cases, the appearance of inflammation may point out a greater degree of disease than had really existed. But does the reverse ever occur? Can inflammatory injection exist, and yet wholly or altogether disappear after death? Bichat and Broussais are both in favour of this opinion, and hold that although no redness may be found in the part after death, yet, notwithstanding, it may have been inflamed and vascular during life. This is a doctrine of importance from the dangerous use which may be made of it in pathology.

It is true that after death the traces of erysipelas will greatly, if not altogether, disappear in some cases, and the same has been observed with respect to the redness of a sore throat. Bichat explains this by stating that the injection of the capillaries ceases as soon as the irritation which caused it becomes extinct with the life of the patient, and lays great stress on this point in its application to morbid anatomy. But cadaveric pallor of parts previously inflamed, though occurring in some cases, is far from being a general phenomenon, and where the inflammation has been intense, as in severe cases of erysipelas or angina, the redness will remain long after death. Besides, it is scarcely logical to draw conclusions as to the viscera, from what occurs on the surface. We know that in most cases of death the blood appears to forsake the exterior, to accumulate in the interior of the body, and that this process goes on for some time previous to the extinction of life. If this post-mortem emptying of the capillaries went on in the mucous membranes as we see it in the skin, redness of these tissues should be as rare as that of the skin; but the contrary is the fact. We may admit the possibility of this subsidence of the appearances of inflammation of the mucous membrane in very slight cases; but looking at the phenomena of death in general, we must hold it more probable that these appearances will be augmented rather than diminished on the cessation of life.

But there is one cause for the want of redness even where a high degree of irritation has existed in parts, namely, the supervention of inflammation in other viscera, which, from its excess, causes an actual revulsion. Thus, when a bronchitis subsides on the supervention of a fatal diarrhœa, we may find the bronchial membrane free from vascularity, or *vice versâ*. The cause is alluded to by Billard. In the severe gastro-catarrhal fever, we constantly observe alternations of severity in the abdominal and thoracic symptoms, and more than once we have seen cases in the early stages of which the symptoms of enteritis were severe, but subsiding when the thoracic irritation became intense, *and have found the intestinal membrane pale, although ulcerations and other disorganizations were present.*

With respect to the relative frequency of inflammatory redness in different parts of the digestive tube, it is agreed that the stomach and lower part of the ileum are most commonly engaged, and it is remarkable that the two affections often coincide. This has led to the term *gastro-enteritis;* a term, however, which cannot be adopted, as the coincidence is by no means universal, and as by a too great generalization, it leads to an erroneous view of the disease. The order of frequency, as given by Andral, in the remaining portion of the intestine, is as follows:—the cæcum, colon, rectum, duodenum, superior portion of the ileum, and, lastly, the jejunum.

Increase of development, or hypertrophy of the coats of the intestine, is generally the result of a process of chronic irritation; the thickening of the mucous membrane which occurs in acute affections being more apparent than real, and owing to vascular turgescence merely, while that in the chronic cases is a true hypertrophy, the result of an increase of nutrition. The parts which, in acute diseases, are most usually increased in bulk, are the mucous membrane, and the glands of Peyer and Brunner, while all the constituents of the tube may become hypertrophied in the chronic enteritis. The thickness of the sub-mucous cellular tissue is rarely altered in acute, but commonly in chronic cases.

When the mucous membrane is hypertrophied, we find the change to be circumscribed, or the contrary, and seldom observe the tissue equally thickened. In the large intestine we have commonly found the mucous membrane elevated into numerous nodules, of about the size of a pea, between which ulcerations, or a lesser degree of hypertrophy, existed. Numerous varieties of these elevations are described by authors. In cases of this hypertrophy the consistence is generally increased, and the colour dark: and it rarely happens that the change is confined to the mucous membrane alone; it occurs much more frequently in the large than the small intestines.

But of the forms of hypertrophy of the intestinal tunics, that of the sub-mucous cellular tissue is the most important. In this state we find it a dense white layer, sometimes more than two or three lines in thickness, presenting a distinct fibrous structure, and giving to the whole tube a remarkable feeling of thickness and rigidity. The induration is often so great as to cause a grating sound when the intestine is divided by the scissors. The principal seat of this alteration is the sub-mucous, but we have often seen it to engage also the sub-serous cellular membrane. It is in the large intestine that the change is most usually observed, where, after chronic dysenteries, it is found in conjunction with other disorganizations. In the small intestines, however, it may be met with, generally partial, and in the vicinity of old ulcerations; but in a few cases of severe chronic enteritis we have found hypertrophy of the whole cellular membrane from the pylorus to the anus. These were cases where severe symptoms had continued for months, the patients presenting that singular tenacity of life observable in greatly emaciated subjects.

To this change is to be referred most of the cases of organic stricture of the intestine: indeed, when examined anatomically, we can see in this disorganization nothing but a partial hypertrophy of this tissue, generally traceable to a process of inflammation in the mucous membrane. We say generally traceable, for although in the present state of the science we must attribute most of these cases to this cause, yet in some it may arise from a morbid process, not originating in or extending to this tissue. These, however, may be looked on as exceptions to a general rule, and, as far as we have seen, seem connected with a disposition to cancerous degeneration of the cellular membrane, both in the solid and hollow tube.

This alteration, as a result of chronic enteritis, may be met with in all ages, from the infant to the octogenarian. It is, however, stated to be most common between the ages of thirty-five and sixty-five, and that between puberty and the first of these periods it rarely occurs. We have already alluded to the atrophy of the intestinal tube, a change which may be confined to the mucous membrane alone, or engage all the coats of the intestine. How far atrophy can be referred to a process of inflammation does not yet appear to be determined, as there is a difficulty in the circumstances of the general nutrition being impaired in these cases. We have seen ulcerations coinciding with an atrophy of the intestine, but in all these cases great emaciation had existed some time previous to death. This atrophy appears always to coincide with a softened state of the mucous membrane.

Change of consistence is always admitted as one of the consequences of inflammation, and, with a few exceptions, the rule, that a chronic irritation tends to harden, while an acute tends to soften parts, is generally found to be true. In the gastro-intestinal mucous membrane the latter part of this proposition is, in our experience, always true; but we cannot make this statement with respect to the first part, the fact being that an indurated or softened state may result from a chronic enteritis, though the first effect is the most usual. We have found the indurated state of the mucous membrane under the two following circumstances: first, in cases of chronic dysentery, where the mucous membrane of the colon was hypertrophied and ulcerated; between the ulcerations the consistence of the membrane was greatly increased: secondly, we have seen, in cases of scirrhous degeneration of the subjacent cellular tissue, the mucous membrane of the small intestine singularly changed; it resisted traction remarkably, had lost the velvety feel, and gave to the touch precisely the sensation that is presented by the vagina in cases of advanced cancer of the uterus. The parts most indurated appeared to be the projecting edges of the valvulæ conniventes, and the whole of the membrane was studded with extremely minute and hard granulations.

We now come to the consideration of the inflammatory ulcerations of the intestine. When we compare the bronchial and intestinal mucous membranes in their pathological states, we must be struck with the difference in the frequency of ulcerations in these tissues. In the first, they are of rare occurrence, in the latter extremely common; in the first we constantly see an acute or chronic inflammation without a trace of ulceration, in the latter this effect constantly results from both these forms of disease. This difference may be explained by considering the great predominance of the mucous crypts in the gastro-intestinal system, as compared with the respiratory.

In fact, for the healthy performance of the respiratory function, a very small quantity of mucous secretion is required, but the reverse is the case as to the function of digestion. We must also take into account the greater exposure of the digestive canal to chemical and mechanical stimulation.

The circumscribed ulcerations of the intestine may be divided into two classes, those affecting the mucous membrane alone, and those engaging both this tissue and the mucous glands. The first of these species is the rarest; the second is extremely frequent, and is called the follicular ulceration.

As the minute description of these ulcerations is not of much practical importance, we shall not enter into the subject here, and shall merely refer to the late works on pathological anatomy, and to the article Fever, for complete information. Suffice it to say, that they are extremely frequent, and that their varieties, with respect to number, appearance, and accompanying disorganizations, are infinite. The cases in which they are most frequently met with are the following:—typhous fever, with predominance of gastric symptoms; dysentery; long-continued diarrhœa; stricture of the intestine; infantile remittent; tabes mesenterica; tuberculous phthisis, and in cases of hypercatharsis, from an over-dose of purgative medicine.

In the great majority of cases these ulcerations do not perforate all the coats of the intestine, but in a few this does occur, and the result is most commonly an effusion of the contents of the intestine into the peritoneal cavity, and consequent rapid peritonitis. Two important facts seem ascertained with respect to these perforating ulcers, *first*, that they are almost always the result of disease in the mucous follicles, and, *secondly*, that they are more liable to occur from acute and circumscribed than from chronic and extensive disease. We may explain this by considering, that in the chronic ulcerations the cellular membrane at the base of the ulcer is generally more or less indurated and hypertrophied, which gives it an increased power of resistance to the ulcerative process, and also that from the general emaciation which commonly occurs in such cases, the tube is in a state of anæmia, where, of course, inflammatory action will occur with a lesser degree of activity. The extent of the disease, by diminishing its intensity in any particular point, may also contribute to this result.

The situation of the perforating ulcer is remarkably similar in most of these cases. In the ten examples recorded by Louis it occurred somewhere in the last twelve inches of the ileum, and out of the same number observed by us in the Meath Hospital, but one instance occurred where it was in a different situation, namely, the cæcum. This ulcer was also remarkable in not presenting the follicular character. We may remark, that these observations as to the situation of the perforating ulcer apply principally to the acute cases.

Effusion of the contents of the intestine is not a necessary result of this lesion, as the serous covering of the adjacent fold of intestine may form adhesions round the edges of the ulcer, and thus constitute its base, or a direct communication may be formed between two portions of the tube previously in contact. In both these cases the occurrence of general peritonitis is not a necessary consequence. (See the article Peritonitis.)

Treatment.—We shall first examine the treatment of the disease as it occurs in the *infant* and *child*. In most instances of this affection we may admit of two stages, indicating a different treatment; the first, where the antiphlogistic method is to be our chief resource; the second, where revulsives and the cautious use of the tonic plan are indicated.

In this affection it is not often necessary to have recourse to the lancet, although such a case may arise, as where the symptoms are violent, the fever high, and the constitution healthy and robust: here venesection cautiously performed will generally be followed by the best results, and be the best preparative for other measures. In these countries a prejudice against bleeding in the child sometimes exists, but we believe that it is unfounded. More than once have we seen the symptoms continuing with violence, and even resisting the employment of leeches, until blood was taken from the arm; then the remedies which had before failed acted well, and recovery was progressive and ultimately complete. When we cannot succeed in opening a vein in the young infant, the mode from which most advantage is derived, is the application of a leech or two to the back of the hand or foot, and afterwards plunging the part into warm water; in this way we can obtain a considerable quantity of blood, and the hemorrhage is easily controlled by a bandage.

If the bowels should not be open, it is advisable to procure a moderate evacuation of the tube, but no violent or irritating purgative is on any account to be given, and we should trust chiefly to the mildest laxatives and to injections, which are almost always productive of the best effects. It sometimes happens, after the above means have been employed, that the disease appears either to be subdued or greatly lessened in its intensity; the tongue cleans and the fever is much diminished; but in more violent cases this alteration is scarcely perceptible, and then no time is to be lost in applying leeches to the belly. This may be done at all ages, and is without exception our most powerful remedy in most cases. The number must be proportioned to the violence of the disease and habit of the patient. We have seen three or four leeches applied to the abdomen of an infant of twelve months old with the best effects; but, as a general rule, a leech for every six months of the child's age up to that of four years would not be excessive. These may be re-applied according to circumstances, for it often happens that symptoms, scarcely if at all affected by the first application, will subside on the second. The prejudice against the use of leeches in the diseases of children is fast wearing away; in fact, the only objection of weight is the difficulty of arresting the hemorrhage. For this purpose the simplest and most efficacious mode is the application of the solid nitrate of silver to the leech-bite. A stick of caustic should be cut down to an extremely fine point, and being pressed to the bottom of the wound, (which should be previously dried by a little lint,) and given a turn or two, is then to be withdrawn: this seldom fails to stop the bleeding at once.

The internal remedies from which we have seen most advantage are the combination of a mild mercurial with Dover's powder, and, in the next place, gummy solutions. The hydrargyrum cum cretâ, with Dover's powder, may be given in repeated doses, proportioned to the age of the patient. An over-degree of narcotism is, of course, to be avoided; but it frequently happens that, after a decided opiate effect has been produced, the symptoms of intestinal irritation greatly subside. It is a remedy that requires caution in its exhibition, but one of great utility. It sometimes constipates, and when this occurs it may be omitted, and a small quantity of castor oil or manna may be given, assisted by an emollient injection; and when these have performed their office, the remedy can again be resumed.

In some cases it may be desirable to produce a decided mercurial action. To excite this in the child is a matter of great difficulty, and our own experience leads us greatly to prefer the external application of mercurial ointment to the administration of much calomel. We have known a mercurial plaster, or dressing a blistered surface with the ointment, answer remarkably well. But in every case we should endeavour to remove the disease without the exhibition of a great deal of mercury, as its effects in children of an unhealthy habit are often most formidable.

Blisters have been used in this disease with various results, and if they are not employed until the advanced stages of the affection, and are employed only as secondary to general or local bleeding, they will often be useful. In young children they should never be left on for more than two or three hours, and in older patients they should be removed as soon as uneasy sensations are perceived from them. It is always advisable to insert a piece of silver-paper between the blister and skin. As a general rule, it may be stated that blisters should not be used when the skin is very hot, the fever high, and the patient in a state that would admit of general or local bleeding. Perhaps they may be more safe in those cases where the mucous inflammation has arisen from the suppression of a cutaneous irritation.

There is a difference of opinion about the utility of the warm-bath. We have found it chiefly useful in the advanced stages, and where there is much diarrhœa; but it appears to us that the practice of diligently fomenting the belly is as serviceable, and one which may be used in all stages.

The little patient must be kept on an extremely strict regimen, and every thing that could possibly disagree must be avoided. A strict regimen is peculiarly necessary in the enteritis of children, as the slightest irregularity in this respect may produce a fatal relapse. Cold water may be freely allowed and may be slightly acidulated, according to the feelings of the patient; in addition to which we have always been in the habit of administering in some quantity a solution of gum arabic, and have seen, in cases where the disease predominated in the lower portion of the tube, the most decided benefit from it. But after the first week of the disease it becomes necessary to attend to the support of the patient. Many children are lost by the practitioner neglecting this point. Small quantities of the farinaceous foods, milk and water, and very weak chicken-broth may be used, and their quantity regulated by the effect on the symptoms. These should be given at stated intervals of time, say every third hour; and it may even be necessary in the advanced stages to administer a little wine, particularly when the skin is cool, the countenance sunk, the mouth covered with sordes, and the stools involuntary. Should this excite a too strong re-action, it can be omitted, and again resorted to if necessary. Great attention must be paid throughout to prevent excoriation of the back, and to preserve the warmth of the extremities, and the apartment should be kept at a regulated temperature. This, among its other advantages, will tend to prevent the liability to bronchitis, which disease sometimes carries off the patient after the subsidence of the enteritis.

Enteritis in children is commonly mistaken for worms, and thus improperly treated. Drastic purgatives are lavished; the increase of symptoms and the marasmus are attributed to the persistence of the worms; until at length typhoid symptoms appear, or the child falls into the state of *tabes mesenterica*. These cases are always of the worst description from obvious reasons. It would appear that when the disease arises from the use of indigestible food, or from constipation, purgatives cautiously exhibited at the outset are useful; but if after the unloading of the bowels the symptoms continue, it is a sign that something more than mere irritation from the presence of noxious substances exists, and that we must treat the disease as one of enteritis. These remarks apply equally to the enteritis of the child and adult. The indiscriminate system of purging in all cases is the opprobrium of British medicine; for it is a fact that, since the writings of Hamilton and Abernethy, too many practitioners have had, in the treatment of digestive derangements of most kinds, but two objects in view, the one, of giving doses of purgative medicine, the other, the quantity and quality of the fæcal discharges; while the gastro-intestinal surface, that prodigious vasculo-nervous expansion, has been wholly unheeded and forgotten.

Cerebral symptoms often supervene in the course of this affection, and it is sometimes difficult to say whether they proceed from actual disease of the brain, or merely indicate a sympathetic excitement not amounting to positive inflammation. But we know that sympathetic irritation cannot long exist in so delicate an organ as the brain without producing disease, and further, that we cannot tell when this change takes place. Hence the safe mode of proceeding is always to treat the cerebral symptoms as if they really proceeded from encephalitis. In such a case it is generally unnecessary to use the same degree of vigour in treatment as if the disease was idiopathic inflammation.

When the disease occurs in the *adult*, the chief remedy will be found to consist in the detraction of blood generally and locally, but particularly the latter, unless in cases where the symptoms run high and threaten peritoneal inflammation. Here the lancet is never to be neglected, and its use must be repeated frequently if the violence of the disease is not subdued. Dr. Abercrombie recommends the practice of following up the first bleeding by smaller detractions of blood, so as to keep up a decided impression on the system. It seems, however, that in most cases we may look on general more as a preparative for local bleeding, which, when properly performed, is a means of extraordinary value. Facts, however, oblige us to admit the efficacy of general bleeding alone in reducing inflammations of the mucous membrane. (See Cheyne's Report on Dysentery.) When the disease exists in the small intestine, we have always found most advantage from local bleeding. It may be performed at various stages of the disease, even when there is great adynamia, and will seldom disappoint the practitioner. Leeches should be applied abundantly round the navel or to the ileo-cæcal region, and the hip-bath used when they fall off. If the symptoms do not yield at once to this treatment, the leeching is to be boldly repeated, and a large poultice applied over the belly. The bowels are to be gently opened by the mildest laxatives, and emollient injections should be frequently given.

The most distressing symptoms in this disease are the vomiting, thirst, tympanitis, and diarrhœa. It is often very difficult to allay the first of these. We have found nothing so efficacious as the application of a dozen leeches to the epigastrium, and the liberal use of iced water, or even plain ice, which may be given nearly ad libitum. It is a most grateful and important remedy, and one from which we have never seen any unpleasant results. In the more advanced stages of the disease we have constantly applied leeches to the epigastrium, though in a smaller number, and have seen that assemblage of phenomena which constitute the typhoid state speedily disappear after their use. In addition to this, we have in the hospital often applied a small blister over the region of the stomach, and afterwards sprinkled the surface with a little acetate of morphia, a practice which, in some cases, succeeded remarkably. Effervescing draughts, with the carbonate of soda or ammonia, may be exhibited, but not in too great quantity, as violent diarrhœa and exasperation of all the symptoms may be the result of this excess. Lastly, opiates, and, in some very advanced and low cases, stimulants may be used with advantage. The thirst may be moderated by the use of cold acidulated drinks, such as lemonade, the cream of tartar solution, and tamarind-tea; but let it never be forgotten that the means best calculated to remove these symptoms are those calculated to reduce the inflammatory action. The tympanitis, when it arises, is a symptom commonly maltreated from ignorance of its pathology. Occurring in the early stages of the disease, it is generally in proportion to the intensity of the inflammation. It is a distressing symptom, and hence practitioners are over-anxious for its removal, and are tempted to exhibit turpentine. From witnessing a great number of cases where this practice has been pursued, we feel certain that the exhibition of turpentine or analogous remedies for the removal of tympanitis in the early stage is a practice pregnant with danger. It often, indeed, renders the belly flat; but this apparent advantage is commonly followed by an increase of the other symptoms; and the tympanitis is sure to return. If the symptom be not severe, its presence should not make us modify our treatment; if it is excessive, it becomes a sign for increased activity in means calculated to reduce the inflammation without endangering the safety of the patient. In addition to this, stimulating injections, where there is not tenesmus, may be used, and enemata of cold water in all cases. In the stages of the disease, however, where depletion can no longer be practised, the use of turpentine is sometimes successful, a circumstance reconcileable with our knowledge of the effects of stimuli in the advanced periods of mucous inflammation.

Nearly the same remarks apply to the diarrhœa. The exhibition of astringents in the early stages is generally followed by the worst effects, a circumstance favouring the doctrine that the secretion is the relief of the inflammation; but when the powers of life are low, and the disease not acute, we must moderate it. This is best done by the warm bath, a flannel roller, the occasional application of a blister to the belly, anodyne injections, and the use of small doses of Dover's powders, with or without rhubarb. Where the diarrhœa was severe and the patient much depressed, we have often used large doses of opium with the best effect.

The remarks as to revulsion, regimen, &c. which we made in treating of the enteritis of children, apply equally in this form of the disease.

[The treatment adapted for *inflammation of the cæcum* is that of local inflammation in general. General blood-letting may be required, but it cannot be necessary to repeat it often. The great indication is, to temper the inflammation as far as possible, and especially to remove the cause, where the disease is owing to hardened excrement, or to any undigested matter,—as stones of fruit, charcoal, magnesia, &c., which are sometimes known to lodge in the cæcum.

Simple typhlitis of the mucous membrane requires the same treatment as colitis; and perityphlitis the same management as any case of partial inflammation of the cellular or serous membranes.

In cases of inflammation of the cæcum from mechanical causes — *typhlitis stercoralis* — after general blood-letting has been practised, leeches may be repeatedly applied; the practitioner bearing in mind, however, that if he be unable to prevent the supervention of suppuration, he may do mischief by reducing the powers too much. After the leeches have dropped off, a large warm poultice may be applied, or if this cannot be borne, a hot and dry fomentation of chamomile flowers in a flannel bag. The most important fomentation is warm water sent copiously into the colon, which may be thrown in by means of one of Dr. O'Beirne's rectal tubes. In this manner, the impediment may be removed. If repeated glysters be unable to accomplish this, cathartics—as oleum ricini, or infusion of senna with salts—may be administered, in addition, by the mouth.

It can rarely be necessary to have recourse to more powerful remedies than these, repeated every two hours until an evacuation takes place, and aided by the enemata recommended above, or with the addition of castor oil. The hot bath has been proposed, but it possesses no advantage over hot fomentations, whilst the motion, to which the patient's body is necessarily subjected, renders it objectionable. In the course of a few days, the bowels may begin to be evacuated, and lumps of undigested matter — the cause of the whole mischief — may be perceptible in the discharges.

If signs of suppuration occur, poultices may be applied; and if there be reason to believe that the parietes of the abscess adhere to the walls of the abdomen, which may be determined by trying whether the latter glide over the tumour, the sooner the abscess is opened the better. Commonly, the tumour gives an emphysematous feel, and if a free incision be made into it, a fetid gas with an offensive fluid will be discharged.— This emphysematous condition must be distinguished from the sound rendered on percussion, when the pus has formed on the posterior surface of the cæcum, and pushed the intestine before it. In such case, the intestine may be wounded, as has happened, we are told by Grisolle, in one case. After the abscess has been opened, the discharge of its contents must be favoured by placing the patient on his right side, and the system be supported by wine-whey; arrow-root, or sago and wine; beef tea, and the preparations of bark. Opiates will likewise be required to produce sleep.

Where the perforation takes place into the cavity of the peritoneum, the case must be managed as directed under the head of Perforation of the Intestines. Little, however, can be done except to administer full doses of opiates.

Lastly,—where the abscess is so deeply seated, that an opening into it cannot be made with safety, it has been proposed to endeavour to promote the absorption of the pus by means of repeated blisters, or by moxa applied over the abscess.

The treatment of *inflammation of the appendix vermiformis cæci* is the same as in perforative inflammation of the cæcum. As in all cases of inflammation likely to terminate in extensive suppuration, in which the recuperative powers have to be greatly exerted, care must be taken not to reduce too much by general blood-letting, too often, or too largely practised in the early stages. Every practitioner is aware of the difficulty of arresting the suppurative process; and, consequently, if the inflammation be not got under by antiphlogistics in the first few days of the disease, the farther use of depletives should be had recourse to, under a wise caution; for it is proper to remark, that the disease occurs at times very insidiously.

The treatment of sero-colitis is the same as recommended in acute and chronic inflammation of the peritoneal coat of the small intestines, and in inflammation of the cæcum.]

W. STOKES.
[ROBLEY DUNGLISON.]

[ENTERORRHŒA. (See DIARRHŒA.)]

EPHELIS (from ἐπὶ and ἥλιος, *sol*,) a genus of diseases of the skin, of the order *maculæ*, (see the article MACULÆ,) characterized by discolorations, varying from dark brown to greyish-yellow, and presenting a great diversity of form, from small distinct points, sometimes scattered, sometimes grouped, to large confluent or continuous patches.

Syn. Maculæ fuscæ (*Plenck*); Ephelides (*Alibert*).

We use the term *ephelis* in the extensive sense which has been given to it by Gorræus — "non quod à sole tantum vitia illa in cute contrahuntur, sed quod à reliquis inducta causis, similem asperitatem et colorem habeant;" (Defin. Med. ad voc. ἔφηλιν,) although we do not altogether agree with Bateman, (Synopsis, p. 442,) that this acceptation of the term is sanctioned by the authority of Hippocrates, (Prædict. lib. 2. xxxi. 9; de alimento, iv. 11; de sterilibus, vi. 8; de morb. mulier. lib. 2, lxvii. 6, lxviii. 1,) for he appears to have distinguished between *lenticula* (φακὸς) and *ephelis*, both included in this definition. Celsus went farther; he not only distinguished between *lenticula* and *ephelis*, but also between *lenticula* and the φακία of the Greeks. (De Medicinâ, lib. vi. cap. 5.) These distinctions were lost sight of, and the term *ephelis* was made more comprehensive by Oribasius, (De loc. affect. cur. lib. iv. cap. 52; Synops. viii. 33,) Ætius, (Tetr. ii. serm. iv. cap. 11,) and Actuarius. (Meth. Med. iv. cap. 13.) Sennertus (De cutis vitiis, lib. v. pars 3,) revived the ancient distinctions, in which course he was followed, more or less, by Sauvages, Lorry, and Plenck; but whilst the first of these raised distinctions on one hand, he removed them on the other, and thus included under *ephelis* morbid appearances which have no relation to it. This last is also the error of Alibert, who, in his order of *Ephelides*, includes scorbutic blotches.

These affections of the skin seldom demand or deserve, on their own account, the attention of the practical physician; but as signs of internal disorders they sometimes afford very valuable diagnostic evidence, as much as erysipelas, urticaria, prurigo, and many other eruptions. And we perfectly agree with Alibert, that they afford matter of interesting research to the physiologist, showing how the integuments may become discoloured, and revealing in some manner, by external appearance, the alterations to which the human body is subject. Besides, it is shown in the study of the natural sciences that the most trifling facts may be useful, because, being connected by an almost imperceptible chain with phenomena much more important, they sometimes indicate, sometimes explain them.

The process of the formation of the ephelis is unknown. It is not the result of any particular alteration of the epidermis, but some modification of the pigmentum of the skin which science is not yet able to explain. It would seem sometimes to be a consequence of an inflammatory action; it is frequently accompanied with signs of a determination of blood to the skin, but neither of them is constantly observed. It is very variable in its progress and duration, sometimes developing itself fully and extensively in the course of a night, sometimes very slowly; sometimes it is permanent, continuing indelible for several years, and sometimes it disappears after a single bath or lotion.

Not having found any previous arrangement of this genus which satisfactorily comprehends all its varieties, we propose considering it under two species, viz. 1. Ephelis *lentigo*; 2. Ephelis *diffusa*.

1. **Ephelis lentigo.** *Syn.* φακὸς (*Hipp. et Græc.*); Lenticula vel lentigo (*Latin*); Ephelis lentigo (*Sauvages* and *Alibert*); Lentigo (*Lorry, Plenck*); Lentigo ephelis (*Frank*); Sommersprossen et Sonnensprossen, Sommerflecken (*Teutonicè*). Freckles.

An eruption of small minute spots of a fawn, yellow or brown colour, sometimes disseminated, sometimes in clusters, unaccompanied with any pain or itching.

This eruption presents itself under two circumstances; it is either hereditary, a natural deformity of the skin, or is purely accidental, the result of exposure to the sun's rays. This affords the division of the species into two varieties: *a.* Ephelis *lentigo materna*. *b.* Ephelis lentigo *æstiva*.

a. Ephelis *lentigo materna*. Tâches de rousseur (*Gallicè*). The well-known lenticular eruption, forming, as it were, part of the natural complexion of yellowish or reddish-haired persons, who are, besides, distinguished by the strong odour exhaled by the secretions of their skin. (*Alibert*, Pl. xxvi.) It is more rarely, but sometimes, observed in persons of a fair and delicate skin with dark hair and eyes. The colour and shade of the eruption bear always a near relation to the colour and shade of the hair, being sometimes as dark as coffee or chocolate, and sometimes of a light yellow. The eruption is not confined to the parts of the body exposed to the light and air, but sometimes occupies the whole surface; neither does it disappear in winter. It is to this variety that the French term, "tâches de rousseur," strictly applies.

They who would attempt to cure this deformity would deserve a severer rebuke than that of Celsus — *Penè ineptiæ sunt, curare varos, et lenticulas, et ephelidas.* But the importance attached by the fair sex to this discoloration has not left the matter unattempted — *eripi tamen fœminis cura cultûs sui non potest.* It would be idle to repeat the various means which have been used for this purpose. They who are curious in such matters may consult Ætius, lib. 1. serm. 4. cap. ii.; lib. 4. cap. xiii.; Haly Abbas, lib. 9; Avicenna, Fen. 7. tr. 2; or the monograph of Bender on Cosmetics. (Phil. Ludov. Bender de Cosmet. Argent. 1764.)

b. Ephelis *lentigo æstiva.*—*Syn.* Ephelis: maculæ solares (*Plenck*); Ephelis a sole (*Sauvages*); Nigredo a sole (*Sennert*); lentigo æstiva (*Jos. Frank*); Le hâle (*Gallicè*). Sun-burn.

To this variety exclusively belongs that very common lenticular eruption, chiefly observed in young females of a delicate complexion, supervening with the summer and disappearing with the winter, and confined to those parts of the body exposed to the sun and air.

This eruption is purely a local affection; the radiation of the sun upon the exposed surface of the skin, more particularly observed in youth, being the only cause of this eruption; hence those occupied in the labours of the field, mountaineers, those accustomed to expose themselves bareheaded, or persons pent up and etiolated in cities, when they visit the country are particularly subject to it. This cause may operate quickly or slowly, and the colour of the freckle always bears some relation to the complexion and colour of the hair.

When this eruption does not cease with the removal of its cause, or with seclusion, or the use of veils or shadowing hats, its disappearance may be accelerated by the use of certain local applications; and, indeed, even under the influence of its cause, it may be much moderated by them. Every country supplies some of these nostrums, chiefly domestic, the results of vulgar experience. They are most of them more or less stimulating, but some of them soothing and demulcent. The best practice is for the bland and emollient application to precede that of the stimulating. The former consists of such things as vapour (that of milk was an especial favourite); emulsion of the seeds of cucumbers or melons, or pomatum prepared from those seeds; decoction of the flour of lupines, of tares; the boiled pulp of the roots of narcissus; paste of bitter almonds, and such like. The latter consisted of poultices made of the seeds of cauliflower, or of the flour of tares or lupines macerated in vinegar, or the bulbs of the narcissus boiled in vinegar, to which was added some of the roots of the wild cucumber, bryony, and the leaf-stalks of the fig-tree; the juice of the house-leek, the leaves of the cherry-tree, the leaves of ivy, the ashes of sepia, the bulb of the Illyrian iris, and the bulbs of the lily, mixed with nitre and honey. Ox-gall has been always celebrated. The favourite remedy in the harem of Turkey is said to be a pomatum prepared from balsam of Mecca, the seeds of the garden cucumber and cerussa: in the north of Europe, Goulard's lotion, the juice of sorrel, lac sulphuris macerated in the juice of currants, solution of sulphates of zinc or copper, lemon-juice, oxycrate with camphorated mixtures, rubbing the part with a slice of lemon or of a sour apple. But all these various means may be more conveniently represented by any weak alkaline solution,

(℞ Liquor. potassæ, ʒi.
Aq. rosar. ℥ii. fiat lotio.)

or a diluted spirit or acid lotion.

The following were favourite formulæ much vaunted:

℞ Ol. amygdal. amar. ℥i.
Tartar. per deliquium, ℥ss.
Ol. rhod. gtt. ii. M.

℞ Sapon. venet. ℥ii. solve in
succ. limonis, ʒi. adde ol.
amygdal. amar. Tartar. per
deliquium, aa. ℥ss.
Ol. rhodan. gtt. vi. M. fiat pomatum part. illin.

2. **Ephelis diffusa,** an eruption of distinct or confluent large, irregular, round patches, of a tawny, yellow, or brown colour.

This form of ephelis may be symptomatic as well as idiopathic.

a. Ephelis *diffusa symptomatica.*—*Syn.* Maculæ hepaticæ (*Sennert*, lib. 3, pars iii. sect. i. cap. viii.); Hepatizon (*Var. Auct.*); vitiligo hepatica (*Sauvages*); kelis fulvescens (*Swediaur*): Ephelis (*Plenck*); Chloasma (*P. and J. Frank*); Ephelis hepatica (*Alibert*); chaleur du foye, tâches hépatiques (*Gallicè*); Leberflecke (*Teutonicè*).

This eruption, which is generally preceded by a slight itching, is of the colour of saffron or rhubarb, sometimes pale like the withered leaf; it is most commonly situated on the neck, sometimes surrounding it like a cravat; on the abdomen, especially on the region of the liver, over the kidneys, or on the groins; sometimes on the forehead. The patches are at first distinct and distant, but extending gradually they run into each other, or they form groups more or less numerous. (Plate LXIX. Bateman's Delineations; Plate XXVII. Alibert.) They are sometimes slightly elevated, and terminated by a desquamation of fine thin yellow scales assuming somewhat of the nature of pityriasis, the *pityriasis versicolor* of Willan, the *chloasma pseudo-porrigo* of Frank; and sometimes they are complicated and coincident with the wheals of *urticaria*. The itching is sometimes much greater than that of pityriasis; it is much influenced by the weather, and increased by being heated by exercise. Alibert has observed that the patches of ephelis are not transpirable, but very dry, whilst the surrounding skin is soft and moist.

This variety of ephelis is sometimes permanent and sometimes transient. In the first state it is met with chiefly in men of close sedentary habits, presenting large blotches upon the abdomen, sometimes entirely encompassing it as a belt, or large patches over the shoulder. Some of these spots it is not difficult to disperse, but some remain indelible. In the second state they are more frequently observed in women in the form of isolated circular patches, appearing and disappearing very rapidly, sometimes in the course of half a day; they are chiefly seated on the back part of the neck, on the throat, breast, and hypochondria. In some women they return at every menstrual period; in others they coexist with suppression of the catamenia, the *chloasma amenorrhœum* of Frank; they afford sometimes a sign of conception, (*Hippoc.* de morbis mulier. *Sennert.* Pract. lib. 5, parts iii. s. 1, c. 2,) appearing as superficial spots as broad as the hand, of a pale yellow or dark tawny colour, without roughness or inequality, most frequently on the forehead, breasts, and abdomen, occasionally disappearing at the end of the first month, but frequently continuing during the whole period of gestation, and not always disappearing on parturition—the *ephelis gravidarum* of Plenck and Sauvages, the *chloasma gravidarum* of Frank. It is remarked that those who are most indisposed by pregnancy are most liable to this eruption. In men they are observed sometimes precursive of a hemorrhoidal flux. In women, the itching attendant upon them is always increased on the approach of the menstrual period. Sauvages says he has not unfrequently observed the eruption of ephelis to be periodical after tertian and quartan agues, and sometimes an attendant of *nostalgia*.

Besides the state of body just mentioned as predisposing to this variety of ephelis, it is frequently accompanied by a serious disorder of the function of the liver, but most constantly connected with chronic irritation of the stomach and intestines. In such cases it is sometimes suddenly excited by any trifling vexation, chagrin, or contrariety, or by protracted application or study.

The treatment of this eruption consists in the appropriate cure of the primary disorder of which it may be a symptom: when connected with the natural functions of the body, it can only be remedied by promoting their more easy performance; when symptomatic of uterine disorder, it demands the treatment of amenorrhœa or dysmenorrhœa, when of chylopoietic disorder, its cure falls under dyspepsia. In general, mild cooling cathartics, light diet, sulphurous preparations, particularly the sulphurous mineral waters, as those of Harrowgate, Cauterets, &c., and, if necessary, a mild alterative of some mercurial and antimonial preparation, constitute the internal remedies. The best external preparations are sulphurous baths, particularly of the natural warm mineral waters, the warm sea-bath, or locally a lotion of sulphuret of potass.

℞ Potass sulphuret. ℥i.
Aquæ lib. ii. fiat lotio.

Camphorated vinegar is also a good local application. When the spots are indolent, friction, and, if not extensive, a sinapism applied for a short time, or a poultice of soft soap, have been known to succeed.

b. Ephelis *diffusa idiopathica.*

We only notice this variety that we may not omit two forms of ephelis enumerated by other writers.

1. Ephelis ignealis (*Sauvages*); ephelis spuria (*P. Frank*); lentigo ab igne (*J. Frank*); tâches de brûlure (*Gallicè*). The mottled spots produced by artificial light and heat, observed on the legs and arms of those who bask over the fire, or on the legs and thighs of women who during winter make use of the chauffepié.

2. Nigredo a sole (*Sennert*); fuscedo cutis (*Plenck*); ephelis umbrosa (*J. Frank*); die braune haut (*Teutonicè*). The dark, swarthy, brown colour of the skin acquired by Europeans who inhabit tropical climates, or by those exposed to salt water and hard weather.

T. J. TODD.

EPIDEMICS. Epidemic diseases (νόσοι ἐπιδήμοι, from ἐπὶ, *among*, and δῆμος, *people*,) are those which attack a number of persons, in any city, district, or country, about the same time or season. They are generally uncertain in their recurrence. When they produce great mortality they are called pestilential. Epidemic diseases are chiefly of the acute or febrile class, some of which are apt to prevail in spring, some in summer, and some in autumn; some in one country, and some in another.

Endemic diseases are found to prevail more or less at all times, in districts where the local causes act, and among people exposed to their operation: but the production of epidemics, inasmuch as they depend on circumstances of a wider range, which are in their nature variable, (such as the vicissitudes of heat and cold, the prevalence of particular winds, the varieties of season and weather, as to drought and moisture, the deficiency or deteriorated quality of different articles of common food, and other things, is liable to great uncertainty in almost every part of the world.

As epidemic diseases are above defined, they do not exclude some that are contagious. Distinctions have been attempted to be established, it would appear unwisely, between epidemic and contagious diseases. An attentive and unbiassed observation of facts removes these unphilosophical distinctions. Many epidemic diseases appear, under certain circumstances, to be communicable by contagion; and some diseases, avowedly contagious, prevail epidemically. Facts, in all ages, would seem to show that most epidemic diseases have a tendency to spread by intercourse with those exposed to the same causes of disease, and thus predisposed to it. This tendency has been made too much of by systematic writers, in some cases; and in other cases, too little. No epidemic disease either attacks simultaneously, or rages with indiscriminate violence, among all classes, in any community; and no contagious disease attacks every one who is fully exposed to its influence. Epidemic diseases, whether contagious or not, have their assigned laws. Even when highly pestilential and destructive, they observe stated seasons, and periods of rise, increase, and decline. When their attack is most sudden and general, they pass over a large proportion of the community. In the former case the disease loses its malignity; in the latter, some constitutions are proof against the common destroyer, without any apparent immediate intervention of art.

It is a rare thing that any one form of epidemic disease rages alone, that is, without being preceded or followed by another. Different forms of epidemic diseases usually succeed each other in a series, either in the same year or in different years: and this is called an epidemic constitution. Sydenham was, of all English physicians, the chief observer of these phenomena, and was preeminently entitled to the appellation of the English Hippocrates: he was of too honest a nature to let preconceived opinions and mere arbitrary names of diseases prejudice his correct observation of their changes from one season to another.

Viewed practically, epidemic diseases require minute and cautious observation on the part of the physician; for diseases of the same name, as Sydenham remarked, often require different treatment at the beginning of the epidemic and at the decline; as they require different treatment in different countries, and frequently in the same, under different epidemic constitutions. The diseases of an epidemic constitution will sometimes show an unusual tendency to one part of the system, and sometimes to another; as they will affect a particular type. This tendency is either to the skin, or the head, or the chest, or the stomach and bowels, and often continues for many months, or even years, in the reigning diseases. It was remarked that at the time the sweating sickness raged in England, other diseases assumed the sweating tendency.

It is much to be lamented that many things stand in the way of accurate knowledge on this subject. It is comprehensive, and surrounded with difficulties, in proportion to the extent and variety of the observations which are requisite for forming scientific conclusions. If medical observers had been contented to look with simplicity into the series of events belonging to epidemic diseases, like Hippocrates and Sydenham, we should not have been so much in the dark at the present day. Facts apparently contradictory, at least as to the proper name and the contagious quality of certain epidemic diseases, such as the Levant plague, the Asiatic cholera, and the yellow fever, have been brought forward by men justly eminent in their profession, but wedded to particular opinions. Hence has arisen the extreme difficulty of knowing the truth. Physicians, on the very site of pestilence, have sometimes, like children at play, taken opposite sides, and maintained their ground with unseemly pertinacity; so that we may look in vain to either party for unprejudiced observations. The records of all modern visitations of pestilential epidemics present us with opinions and statements as much at variance as light and darkness; and hence we must conclude either that one set of observers are right and the other wrong, or both partially informed but blinded by prejudice, so that they cannot see any truth in their antagonists' assertions; consequently, that many things which they report as facts are only partial observations, or vague rumours, or hastily formed conjectures, or unconnected and adventitious appearances. Truth is sacred, and error cannot be propagated without some injury. How incumbent, then, is the duty of medical observers to inquire impartially and to report with fidelity! He that presents us with a physical observation clouded by his prejudices, on a subject so deeply important to the health and welfare of his fellow-creatures, is but a degree less culpable than the man who gives a false colouring to some moral or religious truth, which involves the dearest interests of humanity.

If this view be correct, where shall we look for the facts—strictly such—which may assist our reasonings on this weighty subject? It is not, clearly, to recorded observations of infection and of non-infection, adduced by contagionists and their opponents, that we must refer for those unexceptionable data on which some safe practical conclusions may be built. We may perhaps admit something from each, but must reasonably doubt their wholesale inferences.

The subject would be involved in a cloud of darkness which no diligent and honest inquiry could penetrate, if there were not other things besides facts of infection and non-infection — in short, other facts connected with the origin, spread, and decline of pestilential epidemics, (for to these we shall chiefly confine our attention in the present article)—which, though too much overlooked, throw a good deal of light upon the whole question, and not only point to something quite independent of their contagious and non-contagious nature, but help us to determine how much importance we should attach to these circumstances in the general estimate. It is fortunate for our science that there is such a class of facts, and that the lover of truth has not to range in a wilderness of uncertainty. It is also a source of gratification that many of these facts are admitted by both parties, or at least, with few exceptions, are not denied by either.

Now, the facts of a comprehensive nature above alluded to, which belong to pestilential epidemics, may be classed under the following heads; on each of which it is proposed to make a few general observations, with a view of drawing some conclusions from the whole.

1. The natural signs, which are either the antecedent indications or the concomitants of a pestilential epidemic, such as intemperate seasons and unusual weather, deficient or unwholesome food, mortality among any species of the lower animals, uncommon abundance of some of the insect and reptile tribes, departure of birds, &c.

2. The singular changes which have been observed to occur in the common or reigning diseases of the place, before, during, and after an epidemic pestilence.

3. The changes in the symptoms, or type and character of the epidemic pestilence itself, and the circumstances attending its migrations from one place to another.

4. The facts relating to the connection of epidemic pestilence with offensive cities, marshy grounds, and low filthy situations, bad food, and a condensed, filthy, and ill-fed population, in all countries; and, on the other hand, the exemption of those places where due attention has been given to cleanliness, wholesome and sufficient food, and a rational system of health police.

5. The facts given in evidence from quarantine establishments and lazarettos.

Before we proceed further, it is proper to explain what is meant by an epidemic pestilence: the term is used generically to include several species. It denotes a destructive or fatal disease, which appears at uncertain periods or intervals, but at seasons of the year peculiar to different epidemics and to different countries, in large assemblages of human beings, already predisposed to receive it: it attacks its victims in succession with various degrees of violence, leaving however many untouched, during the course of a few weeks or months, in a particular place or city, and then declines by degrees, as it began, but with diminished force, either moving onwards to other places which it invades in the same manner, or entirely disappearing for the time.

The plague of Egypt and the Levant, the bilious fever of Spain, and the yellow fever of America, the cholera of India, and the low malignant fever of our own country, are different forms of pestilence, observed sometimes to prevail epidemically in their respective countries; for different countries seem to have their particular forms of epidemic pestilence to which they are more liable than to others, and which, in common experience at least, do not invade each country indiscriminately. When individual cases of any of these forms of disease occur at unusual seasons, or at times when there is no tendency in the disease to spread; in other words, when there appears to be no predisposition in the population of any city or town to receive it, the disease is said to be sporadic or local: such cases may appear at any time in the country which gives birth to the disease. If such sporadic or local cases should by any chance appear in other countries, by whatever means occasioned or introduced, a multitude of facts seem to demonstrate that there is no danger of their spreading, at least to any alarming extent.

1. It is stated, by Dr. Mead in his learned Treatise on the Plague, (Chap. i.) that a "corrupted state of air attends all plagues." Dr. Mead was an enlightened physician, and though his work was written professedly to establish the contagious nature of the disease, yet his researches into the histories of the various visitations of pestilence in different countries compelled him to admit that "a corrupted state of air is, without doubt, necessary to give the contagious atoms their full force." Dr. Russell, who practised at Aleppo during the plague of 1760–1–2, admits in its fullest extent the dogma of Mead, but expresses the fact in other terms, more philosophically perhaps; and denominates that state of air which is alone favourable to the propagation of disease, *a pestilential constitution of the air;* without which, he states, "it is incontestable that the plague will not become epidemical." It must not be forgotten that Dr. Russell was a warm advocate for the foreign origin of pestilential contagion; and that he maintained no combination of indigenous circumstances could give rise to the plague in Syria. Sydenham, also, who witnessed the rise of the plague in London in 1665, found it necessary to take a "pestilential constitution of the air" for granted. (Chap. ii. sect. ii.) Here, then, is an ultimate fact, so far as the testimony of such eminent physicians can establish it — a principle on which to found an argument as clearly laid down as any other in natural history. We might not be disposed to contend either for the propriety of the terms used by Mead, or for the absolute correctness of those employed by Sydenham and Russell; but for a state of air, present or just past, and perhaps also of the body, indispensable to the epidemic rage of pestilential fever.

It is a fact too well known to be questioned, that plagues and pestilential fevers, whether the bilious yellow fever or malignant typhus, have often been preceded and accompanied by irregular and intemperate seasons; in other words, by great extremes in the weather. If we examine the histories of the plagues of London in 1625 and 1665, of the Netherlands in 1635–6, of Aleppo in 1740 and 1761, of Marseilles in 1720, and of Malta in 1813; if we turn our eyes to the modern visitations of pestilence in Spain and the United States, and the East Indies; or if we look back to the descriptions of the plagues of Athens and Rome, as recorded by Thucydides and Livy, without laying any stress on the poetic colouring of Homer, Lucretius, and Ovid, we find that some remarkable intemperature of the weather and seasons has been the antecedent, and, generally, a warm southerly constitution of the air a concomitant of these events. This intemperature, whether marked by excessive cold followed by excessive heat, or excessive rains followed by excessive drought, and *vice versâ*, has so often concurred with fatal epidemical distempers to form one series of events, that we have the pestilential constitution or *κατάστασις λοιμώδης* of the observing ancients, especially the Greek physicians, as clearly laid down as any aphorism in our science, and prognostics of pestilence framed accordingly. A volume might easily be filled with facts illustrative of this position; but we must premise one general remark, that, straitened as we are, by the nature of the work, within narrow limits, yet in so comprehensive an argument some general results must necessarily be assumed; pledging ourselves at the same time for the truth of the principle, whilst we are omitting the details on which it is founded.

[About the time cholera first made its appearance in England, in 1832, Dr. Prout noticed a positive increase in the weight of the air, similar to what might be produced by the diffusion of a heavy gaseous principle through the lower regions of the atmosphere. See art. CHOLERA, EPIDEMIC, p. 421.]

There can be little difficulty in tracing a connection between intemperature of the seasons and famine or unwholesome food; and the relation of the latter to the production of epidemic pestilence is more clearly manifest when we consider that its violence almost invariably falls upon the poor. It is a remark of Dr. Mead, deduced from his previous enquiries, and confirmed by every pestilential epidemic subsequent to his time, "that it has never been known when the plague did not first begin among the poor." This observation is strengthened by the histories of the yellow fever in America and in the south of Spain, of the cholera in the east, and of our own epidemic fever, particularly in Ireland. The poor are the chief victims, because they are principally subjected to the exciting causes. (*Heberden*, On the Increase and Decrease of Disease, &c.)

Mortality among some tribes of the lower animals not unfrequently follows intemperature of the seasons. Sometimes this mortality is noticed among dogs, cats, horses, and mules; and sometimes among sheep and cattle used as the food of man. In the pestilence that raged at New Orleans in 1819, we are told that the cattle died:—"horses, oxen, and cows with rotten tongues; sheep and hogs with their hoofs dropping off, and calves with rotten ears." Dr. Hodges bears a very striking testimony to this fact in his Loimologia, or Account of the Plague of London in 1665:—"Many knowing persons," he observes, "ascribed the pestilence to the quantity of bad meat from the preceding sickness among the cattle, which was sold so cheap to the poor that they fed upon it even to gluttony." "It is incredible to think how it raged among them—to such a degree that it was called the *poor's plague*."

The question does not seem to have been entertained, whether the same physical causes which acted upon the cattle might not have acted also on that part of the human species which was most exposed to elemental vicissitudes.

Salvaresa supposes the epidemic fever of 1764, at Cadiz, was occasioned by the old and corrupted corn. "Amongst the poor," he says, "the disorder was most violent. In this year the animals were first affected; and the mortality was principally observed among birds that fed on grain, as pigeons, poultry, &c." (*Dr. Maclean.*)

In the fever of Cadiz of the year 1800, Sir James Fellowes asserts that "the air, from its stagnant state, became so vitiated, that its noxious qualities affected even animals; canary-birds died with blood issuing from their bills; and in all the neighbouring towns which were afterwards infected, no sparrow ever appeared." (*Dr. Good*, vol. ii. p. 74.)

Dr. Mead states that "it has been observed in times of the plague that the country has been forsaken by the birds." This curious fact does not belong only to the form of pestilential fever called plague: it is one of the many phenomena which are scarcely reconcileable with the notion that gives to the causes of pestilence so confined a range as the intercourse with an infected individual or the exposure to fomites. Livy tells us that in the pestilence at Rome, A. U. C. 571, "not a vulture was to be seen for two years:" and Thucydides relates that in the plague of Athens "the birds that usually preyed on human flesh entirely disappeared." Diemerbroeck, the learned and candid author of the work on the plague of Nimeguen in 1636, records that it often happened when canary-birds died without any obvious cause in any house, the plague showed itself not long after in some of the family." He also states that birds were much more scarce than at other times:—"avium multo rarior numerus." It is mentioned by Dr. Short that "during the four months Dantzic was afflicted, in 1709, all kinds of birds, as swallows, crows, sparrows, &c. deserted the city."

"A *rubigo* or mildew, i. e. a dew impregnated with highly corrosive powers, (see *Hird* on Pestilence, p. 91,) was anciently deemed one of the causes of epidemic diseases. The Romans, apprised of the pernicious effects of these mildews, instituted what they denominated *festa rubigalia*, and worshipped an imaginary God under the name of Robigo. Hoffmann mentions such a dew, 'ros valde corrosivus,' as having infested vegetables in 1693–4, whence the cattle died in multitudes. (Tom. i. de Temp. Ann. Insalub.) And Ramazzini ascribes an epidemic to similar dews; at which time the vegetables, corn, and fruit became black, being affected with a 'lues rubigalis.' The same year was remarkable for the scarcity of honey; and most creatures that live upon what they extract from vegetables died or languished. Probably such occurrences led many of the ancient writers to mention the silence of the grasshopper, and the drooping inactivity of the bee and the silk-worm, among the presages of impending pestilence. As to the spots, which are said to have assumed various forms, especially those of *cruciculæ* or little crosses, and to have appeared suddenly on garments, utensils, &c. as they are recorded chiefly on the authority of monks, whose writings are highly tinged with superstition, they are scarcely worthy of serious consideration." (Rees' Cyclop. art. *Epidemic*.)

Most of the writers who treat of the prognostics of pestilence refer to swarms of some of the insect tribes. Lord Bacon particularly remarks that "those years have been noted for pestilential, wherein there were great numbers of frogs, flies, locusts, &c." The plagues of Dantzic, Nimeguen, and Marseilles, and many others, afford illustrations of this fact. To give details of all the natural signs would not be compatible with our object.

2. To found a truth in science we must have recourse to general observations. Isolated facts are only valuable so far as they tend to establish general laws. There is no science in which what are called facts require to be viewed with more suspicion than in that of medicine; nor any department of it where there is more room for error than in that which comprehends the invisible region of contagious miasms and atmospheric impurities. We have the following general observation of Dr. Mead in relation to the matter before us: "Fevers of extraordinary malignity are the

usual forerunners of plague, and the natural consequence of that ill state of air which attends all plagues." This admission cannot but be considered very important. It does not, however, depend upon the authority of Dr. Mead. The fact is confirmed by a most ample induction. Fevers of extraordinary malignity, and other forms of mortal disease, have been observed to be the usual forerunners of plague or epidemic pestilence in almost every country. (See *Webster's* History of Epidemic Diseases; and Researches into the Laws of Pestilence, by Thomas Hancock, M. D.)

It was rather triumphantly stated that the plague of Malta in 1813 formed an exception to this rule, in order to prove the position that the disease was imported from Alexandria; in fact, that no precursor fever ushered in that pestilence: and if we had no other accounts of it than those by Faulkner and Tully, we should have been left somewhat in the dark on this point. But the candid and enlightened Dr. Hennen informs us that "for four or five years preceding that in which the plague raged, sudden deaths were more frequent than ordinary, and during the twelve months immediately preceding, and especially for the last month of the period, the increase was still more remarkable, insomuch as greatly to excite public observation." (Edinburgh Medical and Physical Journal, No. 104.) "Apoplexies (or sudden deaths) and other diseases were never so general or so numerous in the memory of man."

"It is observable," says Dr. Heberden, (see his observations above quoted: p. 85,) "that at its first breaking out the disease has never been known to be the plague. It has moreover very generally been preceded by a severe putrid fever." The plagues of Venice in 1576, of London in 1625 and 1665, of Nimeguen in 1636, of Naples in 1656, of Marseilles in 1720, of Aleppo in 1742 and 1760–3, of Holstein in 1764, and of Moscow in 1771, were all preceded by malignant fevers.

Now if any one should inquire what are the effects of that peculiar state of air which ushers in an epidemic pestilence, the answer attested by long experience is, the occurrence of malignant fever. This is one part of the history of such events. But let us notice more particularly the observation which Dr. Heberden has annexed to the statement of this fact, viz.: that "at its first breaking out, the disease has never been known to be the plague." The simple reason of this extraordinary circumstance, and of the doubts and dissensions which have sprung from it, is the gradual and imperceptible change of the malignant fever into the true pestilential fever or plague, and the contrariety of this fact to the medical systems and authorities which have assigned different forms of the same disease to different classes and orders in nosology. We may almost take shame to ourselves that we belong to a profession which, either from the imperfection of the science itself, or from the deficient observation of its followers, has exhibited so many instances within the last two centuries in different countries, of reproachful contention among the faculty, on the eve of pestilence, about its name and nature; and which hitherto has laid down so few solid data to secure practitioners from future quarrels on the same ground. Leaving the disputes about contagion out of the question, the disputes about names or nosological terms have agitated physicians in Italy and France, and Russia and Germany, and Spain and America, not excepting our own country, till the sober and impartial members of the profession are mortified, and legislatures are wearied and disgusted; for the latter know not what is really matter of fact, and the former are unwilling to ally themselves with such fierce combatants. Lord Bacon's aphorism, in its general signification, has been repeatedly confirmed since his time, that "the lesser infections of small-pox, purple fever, agues, &c. in the preceding summer, and hovering all winter, do portend a great pestilence the summer following; for putrefaction rises not to its height at once." Lord Bacon was too much of a philosopher to interpret the regular series of natural phenomena by his own fancies, and too little of a systematic writer on medicine to perplex himself with the trammels of artificial distinctions imposed by names. But some physicians have endeavoured to show that there was only a casual connection between the pestilential epidemic and the malignant fever, its forerunner; and numbers have on such occasions involved themselves in keen disputes, whether the name of malignant fever or that of plague was the proper appellation of the epidemic pestilence itself. In this way they have too generally trod the thorny ground of contention instead of the simple path of faithful observation; and the consequence is, that we have more of counter-statements than of unquestionable facts reported to us from the scene of every pestilential visitation.

Nevertheless, all is not confusion; and there are some things on which medical science may repose with satisfaction in reference to this part of the subject. Two important observations belong to it: the one is, that the malignant fever which precedes the plague, commonly reappears at its decline; and the other, that during the continuance of the epidemic pestilence itself, at least during its active prevalence, all other forms of epidemic disease, such as those which are peculiar to the place and to the season of the year, are entirely extinguished. With regard to the former, it may be noticed, that one of the first and most evident signs of the epidemic pestilence being about to cease its ravages, is the appearance of another form of epidemic fever, generally of that which preceded, and sometimes of a new train of diseases; this new order of things indicating that the pestilential constitution is changed, or at least, the disposition in the air to foster and spread the principal disease, completely for the time removed. The second fact is interesting, both from the antiquity of the observation and from its accordance with modern experience; that, while the tyrant disease is prevailing, it usurps complete dominion, and suffers no other disease to appear of an epidemic character. This was noticed in the plague of Athens, by Thucydides; and every pestilence since that memorable period has verified the observation. It was noticed particularly in the last plague of Malta. A fact recorded by Sauvages, (Nosol. Method. vol. i. p. 415,) places this circumstance in a very strong light, viz. that when the plague was raging in the south of France in

1720–21, no greater number of persons died of the disease in the town of Alet—and none died of any other disease—during the year of its visitation, than used to be carried off by other diseases, though the plague absorbed all others, or in fact put them to flight while it was prevailing. This is an incontestable fact, and a sufficient answer to those who deny the operation of any general cause. For it is perfectly clear that if a vessel from Sidon brought the plague to Marseilles in 1720, as was alleged, and that the contagion was conveyed from thence to Alet in Languedoc in 1721, as was asserted, this accidental circumstance, upon that hypothesis must have exerted a most extraordinary influence on the atmosphere of the town of Alet, or rather on the constitution of every one in it, if it put every other form of mortal disease to flight for a whole year after.

The general remarks above made, relative to the forerunners of plague and its insidious approaches and dominion over other diseases, apply also to the pestilential fever of Spain, and to the yellow fever of America. "The occurrences," says Dr. Halloran, "which preceded the epidemic of Barcelona in 1821, correspond with the old and recent observations on a similar subject in other countries; it almost invariably happening that the yellow fever of Spain is preceded by unusual diseases of various form and force, more particularly by bilious remittent fevers, which are often so aggravated and malignant that physicians themselves do not venture to define the line of demarcation between them and the avowed epidemic." In the "Sketches of the Medical Topography of the Mediterranean," by Dr. Hennen, who closed his professional career at Gibraltar in 1828, and who observed and wrote with equal candour and ability, we find it stated that, "in 1813 bad remittent fevers preceded the epidemic which raged at Gibraltar, and that its true nature was disguised, till it had made such progress as to be prevalent in every quarter of the town.

With regard to the transatlantic pestilence, Webster informs us that "the yellow fever never occurs in the temperate latitudes of America, except under a pestilential constitution of the air, manifested by other malignant diseases; and that it has been preceded by acute diseases, and followed by remittents, dysentery, and malignant pleurisy."

3. We believe that the remark of Sydenham applies to the plague and the yellow fever, and the Indian cholera, and to every other form of epidemic pestilence; that "all epidemics at their first appearance seem to be of a more spirituous and subtile nature, in other words, more violent and acute, as far as can be judged from their symptoms, than when they become older."

These changes or varieties in an epidemic pestilence, during a few months' career, might be considered at some length under three heads, viz. the proportional mortality, the appearance of the symptoms, and the alleged difference in the contagious properties; but a very brief notice of each must suffice.

As to the first, it appears to be a universal fact, that at the first rise of an epidemic pestilence, the proportional mortality is always greatest; and, on the contrary, at the decline, whether a few months or weeks only comprise the whole career, the disease loses much of its fatal character; putting entirely out of view the interference of medical art in either case. Knowing this to be the law, though we might not be surprised that, at the appearance of a new and formidable disease, when all is perplexity and alarm, medical men should be at a loss respecting the proper treatment, and should often witness the unequal conflict of their science; yet we can scarcely withhold a smile, when we see so much self-congratulation, and the numerous cases of recovery at the decline attributed to some improved plan of treatment.

With regard to the symptoms or outward character of an epidemic pestilence, we believe the assertion may be safely warranted, that it has never happened that the appearances were uniform in its beginning, height, and decline. As to the plague, this is well known to be the case: Sydenham, Russell, and others, note the fact. On the points of distinction between the varieties of the disorder we need not dwell; though it would be a work of no small practical utility to consider the usual periods in which the bubo, carbuncle, purple spots, and milder features of the disease make their appearance. But if our limits allowed, it might be shown that even the quick or apoplectic nature of the attacks at the commencement, bears a near affinity to some of those precursor diseases, which, in London, Marseilles, Aleppo, and Malta, ushered in the pestilence itself; and at the decline the mild features and diminished mortality exhibit a striking contrast with its previous violence and malignity. It would scarcely be right to conclude this part of the subject without noticing an observation of Sir James M'Grigor, showing the varieties which the same disease will sometimes assume under the influence of different localities and seasons. "When the plague first broke out in the Indian army in Egypt, the cases sent from the crowded hospitals of the sixty-first and eighty-eighth regiments, were from the commencement attended with the typhoid or low symptoms. Those which were sent from the Bengal battalion, when the army was encamped near the marsh of El-Hammed, were all of the intermittent and remittent type. The cases which occurred in the cold rainy months of December and January had much of the inflammatory diathesis; and in the end of the season, at Cairo, Ghiza, Boulac, and on crossing the isthmus of Suez, the disease wore the form of a mild continued fever."

With regard to the appearances of the yellow fever in Philadelphia in 1793, Dr. Rush tells us, that "the frequent absence of a yellow colour led to mistakes which cost the city several hundred lives;" as the want of inguinal tumours at the rise of the plague of Messina in 1743, caused thirty-three physicians out of thirty-four to deny the pestilential nature of the disorder, and to neglect the proper means of checking it, till it was too late.

It might appear that we were departing from the rule at first laid down, and entering upon disputable ground by taking any notice of contagion; but the observations to be made being formed by decided advocates of that doctrine, they ought at least to merit due attention from all who do not deny it, especially from those who ascribe so much more to contagion than to atmospheric influence. Dr. Russell informs us that at the beginning of an epidemic plague the contagion is so feeble, in other words, so many of the attendants escape infection, and such long intervals occur between the cases, as to cause serious perplexity respecting the nature of the disorder, (Russell on the Plague, pp. 19 and 261); and that the contagious property is nearly, if not quite extinguished, at the decline, both in persons and clothes, must be obvious to every unbiassed observer who considers the facts; for the disease has never ceased in any place for want of subjects to act upon, (Researches, p. 156.) And the comprehensive remark of Dr. Russell is a striking answer to those who can trace the extinction of an epidemic plague to no other means than police regulations. It is in these words: "From what has been said of London, Aleppo, and Marseilles, it would seem as if there was little observable difference in the mode of its termination, in cities where purification was practised and where it was not."

In all stages of the billous pestilence of America, its contagious property is so indistinctly marked, that Dr. Rush felt himself obliged to confess that "the interests of humanity were deeply concerned in the admission of the *rare* and *feeble* contagion of the yellow fever." And although contagion is what popular opinion fixes upon the plague as its necessary attribute, yet there cannot be a shadow of doubt, that at all times this contagious property of the disease depends on so many contingencies to give it force, as to justify the remark of Dr. Russell, "that the dread of contagion from plague may, consistently with truth, be moderated."

Dr. Russell sums up the matter in these words, after stating that "the constitution of the air is the cause which heightens or lessens the susceptibility of the contagion."—"1st. In the beginning of a pestilence the disease, though less contagious, appears in its most fatal form. 2d. On its increase and height, though manifestly more infectious, the malignity of the effluvia does not seem to be exacerbated, because milder forms of the disease are then more common. 3d. Several persons infected from the same subject are variously afflicted; some in a greater, some in a lesser degree, the disease being modified by difference in constitution. And lastly, persons in constant communication with the sick who have resisted infection in the most contagious stages of a pestilence, are sometimes attacked in its declining state; which seems to indicate some change in the habit of the individual, not the increased activity of the contagious effluvia," (Treatise on the Plague, p. 261.) "At Aleppo there were instances of persons who had exposed themselves two or three successive seasons, being attacked at length when the contagion was fast on the decline, and the distemper had become in all respects milder," (Treatise on the Plague, p. 301.)

In considering the progress of an epidemic pestilence from one country or city to another, it must be viewed as a remarkable fact, that a disease which has become so mild as to lose the power of doing mischief in one place, when transferred to another should begin in the same insidious and destructive manner, and continue to rage with the same violence, and at last moderate its fury in the same way as it was observed to do in the former; making due allowance for the variety of circumstances which must tend to modify the effects in different places. On the common exemption of strangers and others we have not time or space to enlarge.

4. The evidence which bears upon the connection of pestilence with filth, &c., is remarkable: it is both negative and positive. The negative is the absence of pestilence from those cities of Europe, now for more than a century and a half, which have adopted a system of health-police, not by guarding against foreign contagion, but by domestic cleanliness. The positive is the devastation of those where attention has not been paid to these points; and the immediate good effects which have resulted from sanatory regulations wherever they have been adopted. "Dr. Heberden," as was observed by Bateman in an able article on the subject, "has collected the most ample and satisfactory evidence of the connection of plague and of the malignant contagious fever, which usually precedes and accompanies it, (if, indeed, they be not modifications of one and the same disease,) with the filth of crowded, ill-constructed large cities, in all ages and countries." London, Paris, and the cities of the Netherlands, which were formerly scourged by pestilence, whenever untoward causes operated, such as wars, uncultivated fields, famine, or unwholesome food, wretchedness occurring in a congregated mass of human beings, added to irregular seasons and intemperature of the climate, have been comparatively exempt from its visitations since their streets were paved and widened, and kept clean from animal and vegetable filth, which formerly lay in heaps under a scorching sun; since sewers have been dug, and fresh water has been abundantly supplied to them; since houses have been better ventilated, and built more for the purposes of health than of harbouring the greatest mass of people in the smallest possible space; and since all kinds of stagnant pools have been removed from their vicinity. And, besides the exemption from pestilence, the type and character of the reigning diseases in some of these cities have been much changed for the better; and the relative mortality has been wonderfully diminished. This is strikingly exemplified in London.

But as it was always in the most filthy parts of those cities that plague "originated and maintained its head-quarters," so, in other cities, which have been tardy in adopting such improvements, as Marseilles, Moscow, and other places, there was a corresponding liability to its invasion much later than the period above noticed. And now, if we turn our attention to the domestic sources of malignant fever still subsisting in the cities of Spain, which have so often been scourged with it of late years; or to the present state of Constantinople, Cairo, and Alexandria, we need not wonder at the facts which experience has thus unfolded to us from time to time in confirmation of these principles. "All the towns and cities (in Spain) which suffered from the yellow fever were, with the exception of Cadiz, filthy in the extreme, disgustingly so, and very objectionable on the score of ventilation, situation, and form of construction; while the different towns of Arens, Matero, Badalona, Tarragona, Vimaros, Benicarla, Valencia, Alcama, Velez, Malaga, Marabella, Estepona, Vejer, Conil, Puerto Real, Rota Chipiona, Orcos, and Medina Sidonia, all of which are in the vicinity of the sea, and which, it may be presumed, from their relative situations, communicate freely with the theatres of disease, were not affected by the malady. They seldom, indeed, suffered in any other years; because, independent of their localities being better chosen for health, they are comparatively clean." (Good's Study of Medicine, vol. ii. p. 81.)

In the cities of the east which are still scourged with the plague, they nourish from year to year the seeds of the disorder in their own bosoms, in climates, too, the most favourable to the propagation of pestilential epidemics; yet in these very places it is only in seasons when aggravated causes have been operating, that pestilence in an epidemic form appears; and when it does show itself, the phenomena of its beginning, and height, and decline, correspond with those which have been stated to occur in other places, allowing for the difference of climate. Sir John Webb notes the common epidemic, or rather endemic, prevalence of plague in Egypt in these words: and the reader is requested to bear in mind the difference in the violence and symptoms of the disease in its beginning and decline. "The course of the disease is nearly the same every year, and equally varies in different seasons of the year. In Egypt it commences in November, at which time it rages with its most deadly malignity; and those who are affected by it sink into the grave almost without complaint. It continues its ravages with little abatement through the winter and the earlier part of the spring, when, as the weather becomes warmer by the approach of summer, its attacks are less frequent, its symptoms much milder, and it subsides into a manageable malady." Pappon, a late French writer, tells us, that even in Egypt, when it was formerly well cultivated, the climate was healthy compared with that of Rome in its decline.

With regard to the indigenous causes adequate to the production of yellow fever or the transatlantic plague, which Dr. Rush had frequently an opportunity of observing, he states, "Philadelphia must admit the unwelcome truth sooner or later, that the yellow fever is engendered in her own bowels; or she must renounce her character for knowledge and policy, and perhaps with it her existence as a commercial city."

Although extensive marshes give rise to diseases of a febrile character every year among those residing in their vicinity, yet it is often found that, in seasons of uncommon intemperature, the malignity and fatality of such diseases are much increased. And this cause, concurring with other circumstances, has frequently produced a destructive pestilence.

Diodorus attributes a pestilential disease which occurred among the Carthaginians at the siege of Syracuse to the following combination of circumstances:—"the multitude of people confined within a narrow compass, the situation of the camp in a low and wet ground, and the scorching heats in the middle of the day, succeeded by cold and damp air from the marshes in the night." Fracastorius ascribes a malignant epidemic fever in Italy, in the sixteenth century, to an extraordinary inundation of the Po, which, happening in the spring, left marshes, and, those corrupting, infected the air through the summer. Forestus remarks, that from the putrefaction of the water only, the city of Delft, where he practised, was scarcely ten years free from the plague or some pestilential distemper, (Rees' Cyclop. Art. *Epid. Dis.*) "At this day," says Assalini, "the lakes, the marshes, and the filthiness which one finds in the cities of Lower Egypt, are the principal causes of the frequent diseases to which they are subject, and which can never be eradicated until we have found means to purify the atmosphere of their environs. This important advantage may be obtained by draining off the water of the lakes, and filling them up; by keeping the cities clean, paving them, and giving a free exit to the rain water, which, stagnating in different parts of these cities, becomes corrupted, and, conjoined with filth, infects the atmosphere. By similar operations several cities and provinces in Europe, America, and the Indies, have been rendered healthy. The inhabitants of the citadel of Cairo, which is favourably situated on an eminence, during the plague of 1791 were exempt from the disease, which laid waste the lower town; with which, nevertheless, they continued to hold constant intercourse."

Bombay has been rendered much more healthy than it was formerly, by a wall built to shut out the sea, which formed a salt marsh, and by an order that none of the natives should manure their cocoa-nut trees with putrid fish. (Lind on Hot Climates, p. 207). According to Diogones Laertius, Empodocles, the Sicilian philosopher, removed pestilential diseases from the Salenuntians, by conveying two streams of running water into the stagnating river round their city which gave rise to them. (Diemerbroeck de Peste.) Modena was subject to malignant fevers from a like cause; and by filling up the ditches and morasses which surround the citadel, those fevers have almost disappeared. (See *Assalini*, p. 208.)

5. It is a singular illustration of the preceding views, that in none of the quarantine establishments on the continent, and in none of the stations appointed for the purpose in the British islands, along so great an extent of coast, engaged in such universal commerce, and for such a number of years, has there ever been an instance of a person suffering death in the process of expurgation or purification of goods imported from countries afflicted with pestilence. Evidence to this effect, so far as it relates to our own shores, was laid before a select committee of the House of Commons, in 1819. (Researches into the Laws of Pestilence, by T. Hancock, M. D. p. 233.)

Professor Assalini, who has given us some interesting particulars concerning the plague of Egypt, communicates the result of his inquiries respecting the matter in question in these words: "It has often been said, that in breaking open a letter, or in opening a bale of cotton containing the germ of the plague, men have been struck down and killed by the pestilential vapour. I have never been able to meet with a single eye-witness of this fact, notwithstanding the inquiries which I have made in the lazarettos of Marseilles, of Toulon, of Genoa, Spezia, Leghorn, Malta, and in the Levant. All agree in repeating that they have heard of such an occurrence, but that they have never seen it happen. Citizen Martin, captain of the lazaretto at Marseilles, who for thirty years has held that situation, told me that during that time he had seen opened and emptied some millions of bales of cotton, silk, furs, feathers, and other goods coming from several places where the plague raged, without having ever seen a single accident of the kind." The chief physician of the lazaretto at Malta informed Dr. Maclean that during the period of fifteen years in which he frequented the lazaretto, no cargo arrived, the expurgation of which infected a single individual in the establishment; and according to the testimony of the deputy-inspector Grieves, none of the persons so employed were affected in that island during the plague of 1813.

If we go to the Levant, we have the evidence of Sir James Porter, that "all sorts of merchandise susceptible of infection pass through the hands of our English factors at Aleppo, Smyrna, or the places from whence they are shipped; they are examined strictly by them, or by their servants; and there is not upon record, nor has a single living witness ever related an instance of an English factor or servant dying of the plague, at any of the sea-port towns, or in any other part of Syria or Asia Minor, and but one only in Constantinople, in almost a century; though the disease very frequently rages in that metropolis." (Russell on the Plague, p. 309.)

In connecting together the preceding classes of facts and observations, it is necessary to premise that a mere sketch is only given, and very general conclusions only can be drawn; but we believe that no theory of epidemic diseases will be perfect which does not include a comprehensive survey of all these circumstances.

As to the phenomena of the weather and seasons, it must be allowed that the physical signs deduced from their intemperature and irregularities, such as blights, mildew, abundance of insects and reptiles, flight and death of birds, murrain among cattle, and pestilence among brutes, are uncertain in their development in different countries, and even in the same; and that some pestilential visitations have occurred without any very striking signs of this sort having been noticed. But though this may have been the case, it does not appear that extremes of some sort have ever been wanting in the air and seasons as accessories to the cause. The uncertainty, however, in regard to the outward visible signs of atmospheric impurity, as recognized in the *manifest* qualities of the air, has induced some philosophers to suppose that there were *latent* qualities which neither our senses nor chemical knowledge could detect, implicated in the causes of the mischief. Some, accordingly, have given reins to their fancy, if they have not also given occasion to the advocates of contagion to confirm their exclusive opinions, in seeking for the cause of epidemic pestilence in mineral exhalations from the bowels of the earth, emitted by volcanoes, earthquakes, and such-like convulsions. But though we may have some persons admitting a corruption of the air by mineral vapours, and others a contagious seminium as being necessary to the effect; yet a corrupt air which cannot be detected, and a contagious principle which must be hunted for in a variety of channels, and is constantly eluding the search, may still leave the truth in as much obscurity as it was before. We are therefore compelled to leave such unsubstantial hypotheses, for they only remove the difficulty a step. The notion of Sydenham, however, "that epidemic diseases arise from mineral vapours from the inmost bowels of the earth," comes somewhat nearer the truth, if we connect it with the effluvia and the effects of local filth and of animal and vegetable impurities in large, ill-constructed cities and marshy situations. In situations of this sort vapours do indeed, at times, rise from the earth, (if not mineral impregnations,) which are known to be highly destructive. Yet, on the other hand, if local causes like these are existing year after year, and a general pestilence is but rare, how are these to be considered the cause? It cannot be doubted that local filth alone will not explain the circumstance. Like atmospheric intemperature it may contribute something, but it is not the cause. If, however, we add to the effects of unseasonable weather and of corrupting animal and vegetable materials, those of deficient or unwholesome food, and congregate the poor victims together in close sordid dwellings, surrounded and contaminated by local filth, then we fill up the range of predisposing causes which prepare the debilitated bodies of the wretched poor for the sudden invasion of acute disease, and lay them prostrate before the sweep of pestilence. But of famine, or unwholesome food alone, it may of truth be predicated, as of other individual causes, that it will not produce a pestilence. So that neither irregular seasons and bad weather alone, nor the effluvia from putrefying animal and vegetable substances alone, nor vitiated bodily secretions, however concentrated, alone, nor even diseased human secretions, the product of fever, however aggravated, alone, whatever marvellous stories may be attached by different authors to any of these particular circumstances, will ever be likely to produce a general pestilence. This opinion is hazarded, not without being duly weighed, after a careful inquiry into the specific effects of these several causes, viz.: atmospheric vicissitudes; animal and vegetable putrefaction; malaria, whether from marshes or the mouths of great rivers, or cities or camps; famine or bad food; and the concentrated poison of human filth and human disease. Yet the writer of this article is not the less assured that all these causes together have a powerful combined influence in occasioning that predisposition of body without which no epidemic plague will make any progress; without which no contagion will spread; and which, if in some few cases it require the assistance of a contagious principle to produce the disease in time of pestilence, yet in the majority of instances appears to surrender the multitude a prey to the common enemy without the medium of contagious intercourse. Nor is it, on the other hand, to be doubted that fear, wretchedness, fatigue, and excess, with other debilitating powers, both in an epidemic season and at other times, may co-operate with some of the predisposing causes above mentioned; and, perhaps, with contagion, to produce the disease even in the bodies of those who, living in the comforts of life, have been subjected neither to the undermining effects of bad food, nor to the corrupting influence of a vitiated air and local filth. It is probable that a predisposition is formed, occasionally, to take the disease in this way; but that it is very rare, and never has been the cause of general pestilence.

As far as facts therefore enable us to form any general conclusions in regard to the circumstances which conspire to produce a pestilence, the following appear to be legitimate deductions, without having recourse to the obscure notion of a pestilential constitution of the air, except in so far as we may apprehend it as an ultimate fact, for it is in vain to inquire into the subordinate reasons, why an epidemic pestilence, in obedience to the laws of this constitution of the air, either observes certain seasons of the year, or a limited number of weeks or months to run its course, or a progressive movement in families and neighbourhoods, and cities and countries.

1. Intemperature of the air, or a series of unusual and irregular weather, lays the foundation for an acute disease in a congregated mass of human beings.

2. Deficient or unwholesome food predisposes the bodies of the poor, especially, to be acted upon by this intemperature.

3. Local impurities, composed of effluvia from putrefying substances, in the vicinity of marshy situations or of large filthy cities, in proportion to their extent and to the concentration and virulence of the miasmata, aggravate the preceding causes by a partial pollution of the air.

4. Human secretions and excretions, hurtful in this state of the body even without actual disease, but become virulent by accumulation, and poisonous when subjected to fever, acquire a degree of malignity which is proportioned to the congregated mass.

Hence, if the air, and the soil, and the food, and the state of the animal secretions contribute each a part to the production of a pestilential fever, it cannot be said that the cause resides wholly in any one of them. From the combined effects of all, however, a predisposition is formed which makes some inhabitants of a town or city liable to pestilence sooner than others, some towns or cities sooner than others, some nations sooner than others, in proportion as they have been subjected to the causes before mentioned. If so many causes did not successively concur to this effect, pestilence would be much more common than it fortunately is. We do not depend, therefore, upon the casualties of arresting contagious intercourse, or of expurgating imported *fomites*, but upon the rare occurrence of the several subordinate causes, for our exemption.

And if the prudent adoption of some salutary regulations should prove availing, even in the very time of a pestilential visitation, to lessen the mortality and to mitigate the disease, as they have been often found to do, much more should such measures prove availing, when practically adopted in any city, as the constant and habitual means of preservation.

Now, unquestionably, the removal from close and filthy habitations and a vitiated neighbourhood to a pure air, if such can be found; and the separation from each other, and dispersion over a large space of healthy ground, of the distressed multitudes who are thus predisposed, and the supply of sufficient and wholesome food to them; and cleanliness in their persons, clothes, and apartments; have been fully ascertained to be the best prophylactics, even in time of pestilence, which human skill can devise, and the surest means of arresting this formidable evil. The citizens of the United States know well what security lies in these means; the principles are not visionary. And here we must protest against the unscientific attempt to establish a specific difference between the Levant plague and the yellow fever, as to the former possessing a contagious property, and the latter none. It is astonishing that a physician with a mind so energetic as Dr. Bancroft possessed, should have wasted his strength with so much pertinacity in that ineffectual labour. Too much stress has without question been laid upon contagion in both diseases. To take this quality, which is only incidental, from one of these diseases, in order to give it to the other in excess, when it is known that some deny it even to the latter, is not the way to advance our knowledge of this subject. But it might appear invidious to place in contrast with means of preservation and precaution like those just mentioned, the modern European policy of keeping our fellow-creatures, when threatened or afflicted with pestilence, shut up in the hot-bed of disease; the sick and the healthy within files of bayonets, or in the hold of a vessel with a crowded and exhausted crew. Precautions like these, though in good truth their necessity is much to be doubted, we may not call barbarous and unenlightened, if they be sanctioned by a British senate, nor inhuman, though practised by Christian governments of the nineteenth century, in direct opposition to the benevolent usages of Greeks and Romans, and even modern Pagans! But we do call barbarous, and unenlightened, and inhuman, the conduct of those members of our own profession at Noya, who, through fear of the contagion, "carried a spear in their hands for the purpose of killing any patient (and the case really happened) who in a fit of delirium might attempt to seize the physician or attendants." (Quarterly Journal of Foreign Medicine, No. 5, page 7.) Our abhorrence of such cowardice and cruelty is scarcely to be expressed in any temperate form of words. No reasonable man can doubt that the sacrifice of human life from the unwarranted, and, in its effects, unfeeling dread of contagion, operating as it does throughout all its details of practical application from year to year, is and has been enormous.

But, on the other hand, to maintain that indiscriminate intercourse may be allowed between the sick and the predisposed in their impure dwellings, and that human beings may be cooped up together, in plague or yellow fever, or Indian cholera, or malignant typhus, or dysentery, withou adding either to their own danger, or to that of their attendants, is to take that ultra view which is opposed to the experience of all ages. We do not want nice distinctions about a contagious and infectious atmosphere for practical purposes; they are terms which give occasion to many words and to little practical good. The effects of each have been overstated, and of none more than of contagion, when viewed apart from other circumstances. Contagion of any disease can do but little harm at any time, in any country, unless there be a strong predisposition of body concurring with a pestilential season. The signs or indications of this pestilential season, and the way to remove this predisposition, are of far more consequence than the precaution against a foreign contagion. Judicious and moderate physicians are more and more tending to this view of the subject.

Contagion is not a necessary incident of any disease; but some look upon it as constituting the very essence. A few brief remarks on this subject may perhaps be suitable in this place. The public are wearied with statements from medical men, that such and such diseases, of an epidemic nature, are contagious, and that they are not contagious. They may well wonder at the imperfect state of a science which has not yet settled points of so much importance. What are thinking men to conclude when they see medical authorities thus opposed to each other?—either that the opinion of the most eminent physicians is good for nothing, or that both parties are right —in fact, that under peculiar circumstances, these diseases are sometimes contagious and sometimes not. But it is a great misfortune that partial observers allow their minds to be tinctured with exclusive opinions, of which they become as tenacious as if these opinions could be verified by an undoubted demonstration. The consequence is, that little weight attaches to either side. It is too much the habit of all persons to look at pestilential fevers of every kind, as if contagion was the quality which peculiarly characterized them. But a very simple view of the case should convince any one that the animal effluvia, or morbid secretion from a diseased body, which constitutes contagion, is not necessarily a poison to all who come within its influence. Small-pox contagion itself is inoffensive to thousands. In those who have had the disease the predisposition is destroyed. There must be a strong predisposition of body to receive the contagion of any other disease; and this strong predisposition is what lays the multitude prostrate before an epidemic pestilence: so that, in some cases, an intense dose of the poison; in others, its protracted application; in others, an exhausted state of the body from defective nourishment; in others, extreme fatigue and watching, with mental depression; in others, the debility which follows a debauch; proves, one or the other, to be the exciting cause which brings this predisposition into action while the epidemic constitution, whether this depends on the air, or the body, or the season, is prevailing. It is no fanciful idea that an epidemic constitution is thus limited; for how otherwise could it happen that cholera, like influenza, requires but six or eight weeks to run its course, to become, in fact, mild and impotent, after it has raged with fury; while the Levant plague and the bilious pestilence or yellow fever take up three or four months? If cholera halts days between the first few cases, pestilential fever halts weeks. Cholera observes precisely the same law as pestilential fever, when epidemic; it is violent and fatal at the beginning, mild and harmless at the decline; and, if its contagious nature were as well marked as that of plague, we should have the not less remarkable fact, that when it was most violent, and acute, and fatal, it was least contagious, except at the decline, when, as in plague, contagion is extinct.

The preceding remarks have occurred in relation to the predisposing causes of pestilential diseases, which, perhaps, in most cases, go nine-tenths of the way in producing an attack of the disease, or only wait for some exciting cause while the body is already on the verge of pestilence. It remains to offer a few observations on the precursor diseases.

That no pestilence comes alone, or without some heralds of its approach, seems to be a truth fully established in the unvarnished history of every such event. In most places it is the crisis of a series of fatal and uncommon diseases. The forerunner of plague is usually a malignant fever —of yellow fever, a fatal remittent; which often appear again at the decline. The difficulty of distinguishing between this malignant fever and the pestilence itself has never failed to excite dissension among the faculty, both as to the name of the disease and as to its contagious property. These disputes belong essentially to the present state of opinion on this most important subject; and until correct views prevail over Europe, there will not be a pestilential visitation without them. We can easily account for this difficulty; for what nature has joined, both in series and affinity, man has attempted to disjoin. Physicians, therefore, have perplexed themselves with the most unaccountable dilemma that ever found its way into any science. They have acknowledged a disease called malignant fever, which has ushered in an epidemic pestilence, *to be their own*, or at least the product of the country where it appeared; but as soon as a little change in its character has taken place — which amounts to nothing more than a change in degree, not nearly so great as that which takes place in the pestilence itself, in the short course of its career — which change in a few months is put off again, *then* it is to be accounted of foreign origin, and ships and goods are condemned as the supposed channels of introduction; or it is well if even human life, as has often been the case, does not pay the penalty. The word contagion, with the fears attached to it, has been suffered to preoccupy the minds of statesmen and of many eminent practitioners to such a degree as to destroy all scientific research, to send them hunting after an *ignis fatuus*, which never yet was found, and to cause them to neglect those wholesome internal regulations which, if well observed, might bid defiance to all foreign contagions, supersede quarantine, and in great measure relieve commerce from its present injurious restraints.

With respect to that law of pestilence above alluded to, according to which other forms of acute disease are banished while the epidemic pestilence continues to prevail, it is absolutely incredible, or at least inexplicable on any sound principles, that one epidemic disease—whether plague, or bilious pestilence, or yellow fever, or cholera—which banishes a whole host of other epidemic diseases from any country while it is raging, and then suffers them to start up when it is about to disappear, should owe its origin to any other place than to that country. It is quite incredible that the fortuitous importation of a foreign contagion should so entirely change the atmosphere of a country, on which its minor epidemics manifestly depend, as to drive them away in this manner, in order that it may exercise the power of destroying alone, until it shall withdraw itself to act the same tragedy in some other place; not only so, but that the presence of this foreign disease should restrain for the time the operation of the ordinary causes of mortality from the common acute and chronic diseases to which the inhabitants are liable, which is known to be in great measure the case during the rage of an epidemic pestilence.

We might also lay some stress upon the fact that, with singular power of selection, an epidemic pestilence chooses its own season of the year, from which it is observed to vary but little in the same country or climate, both to begin and to conclude its ravages.

If, in addition to these things, we consider the epidemic pestilence itself, and its varying features and character in its short career, we can arrive at no other reasonable conclusion than that it originates entirely where it rages. We have seen that no pestilential epidemic is one form of disease, of unvarying type and destructive power, from the beginning to the conclusion; nor, by the admission of the great advocates of contagion themselves, of equal contagious property in its different stages, if indeed it be possible to ascertain this point, which is a question; and the question hinges upon the very slight degree of contagious property manifested at the commencement, when the disease is most malignant and most fatal, as well as upon the acknowledged extinction of contagious property at the decline.

By these facts we are compelled to admit that such a change takes place in the air, or in the state of the miasmata from the soil, or in the human body, perhaps in all together—a change so extraordinary as to alter the type and character of a pestilential disease from a fierce to a mild state, and to expel it entirely, destroying every vestige of contagious property in it; but according to the doctrine of imported contagion, we must not admit that any combination of indigenous causes can produce it.

We are called upon by the facts to admit that the precursor malignant fever, which is so nearly allied to plague that the most sagacious physicians have allowed their inability to distinguish them, is an indigenous disease; but, in condescension to common opinion, we must persuade ourselves that the disease which expels this native malignant fever, and that only for a time, is *foreign!* It is marvellous that men of science could ever have been influenced to lend their sanction to such incongruous notions. But, in truth, the difficulty of ascertaining the real facts has been the cause of much erroneous opinion.

Upon principles which allow of the domestic origin of pestilence, we can more easily explain the singular facts so frequently recorded in the annals of epidemic diseases, relative to the exemption of foreigners, as well as of the inhabitants of other cities, in a place visited with pestilence. Many facts seem to indicate that it is not the *immediate* state of things only which is to be taken into account, in order to explain the true causes of pestilence; but that the undermining effects of some remote causes, which have been some time in secret operation in certain communities, ought also to be considered; for it is abundantly proved that a peculiar constitution of the air, on which the progress of pestilence in part depends, will not of itself induce the disease in strangers even holding intercourse with the sick inhabitants, without a fit habit of body to receive it. And, on principles like these, we can account for the escape of such inhabitants of the place as are living in clean secluded situations, enjoying all the necessaries of life, and but little exposed to the exciting causes—as in well-regulated hospitals and abbeys—far more satisfactorily than on the supposition that they have been guarded from the contagion.

It is scarcely necessary to recapitulate the facts illustrative of the same views, and establishing the same principles, which belong to the exemption of those cities from the ravages of pestilence, where the wise regulations of cleanliness and attention to the poor have been adopted; and, conversely, the continuing liability of those in which these wholesome rules are neglected.

If we wanted evidence of every other kind, the testimonies of those who have superintended lazarettos and quarantine stations, furnish an argument of no small weight against the doctrine of imported febrile contagion having in any case been a cause of general pestilence; for the confused and contradictory accounts of the supposed channels by which contagion has been alleged to be conveyed into different countries, of which many examples could easily be furnished, might of themselves occasion serious doubts upon the subject.

In conclusion, the separate points of evidence, added together and weighed impartially, constitute a theory or system of connected observations and dependent results, tending remarkably to establish the opinion, with as much certainty as the case will admit, that the whole apparatus of an epidemic pestilence, from beginning to end, is the production of the country where it rages.

T. Hancock.

EPILEPSY.—Every one is aware of the difficulties with which the consideration of this disease is encompassed, especially with regard to its etiology—difficulties which we have no expectation of removing; nor can we hope materially to add to the information which is already before the public relative to the method of treating epilepsy; but we are willing to put our mite into this treasury of medical lore: and being persuaded that those who are afflicted with epilepsy may often be made less wretched, by rendering its paroxysms less frequent, even when the patient cannot be perfectly cured, we willingly avail ourselves of the present opportunity of urging physicians to reconsider this disease with care, and no longer, as many of their brethren have done, to pronounce epilepsy, when unaccompanied with deformity of the cranium or imbecility of mind, incurable, until, first, they shall have endeavoured to correct in the patient every function which is disordered, and until, secondly, they shall have exhausted the whole armoury of the empiric.

Indeed, it would seem that all those diseases which have been termed *opprobria medicinæ* ought to be revised with care, were it only to seek for new and more effectual palliatives. Every year, by the industry and ingenuity of the naturalist, the chemist, and the mechanist, new agents or more refined expedients are discovered for abating the discomforts caused by infirmity and pain; and nothing is more commendable in a physician than being familiar with all those resources of art by which incurable diseases can be alleviated. The euthanasia is a subject worthy of increased attention. The name of Ferriar, who wrote a paper on the treatment of the dying, ought never to be mentioned without an honourable addition, on account of the humanity which guided his pen upon that occasion.

There exists yet another reason why epilepsy should be investigated with renewed attention. This disease has often brought candour and cunning, science and ignorance, into conflict: in the treatment of epilepsy, the empiric, ignorant and bold, and often confident in proportion to his ignorance, is, in the estimation of the world, superior to the physician who is influenced by true principles of science and morality. The physician ought to use all proper means of preserving epileptics from falling into the hands of the designing, whose nets are ever extended to catch the unwary. He ought to avail himself not merely of science and observation, of the advantage which he obtains from being enabled to prognosticate where an ignorant person can only guess, but also of prudent reserve, time, and favourable contingencies;* and he ought not to forget that epilepsy will often spontaneously terminate, which favourable termination nine-tenths of the community, educated and uneducated, patients and their friends, in spite of a disclaimer on his part, will attribute to the last medicine prescribed, according to that established aphorism of popular wisdom, *post hoc, ergo propter hoc.*

Epilepsy, ἐπίληψις, (from ἐπὶ and λαμβάνεσθαι,) so termed from the suddenness of the seizure.

Synonyms. Morbus divinus, M. herculeus, M. sacer, M. comitialis, M. caducus, falling sickness, *mal caduc*, &c. Many of these appellations prove the dismay with which the spectator is affected upon witnessing this frightful disease. When a person, with whom, perhaps, one was engaged in agreeable conversation, and who apparently was in perfect health, suddenly losing all sense, is thrown down and reduced in appearance to a state of hopeless agony, it is not wonderful that, in the days of ignorance, general amazement should have been the consequence; nor that, during the reign of superstition, the frightful scream and struggle of epilepsy should seem to argue the interposition of an offended deity, in this emphatic manner testifying disapprobation of passing events. Thus did the most politic nation of antiquity interpret the occurrence of epilepsy during public business, nor did they hesitate to dissolve a meeting the moment that so apparently portentous an eruption took place.

Even now, when the mind is strengthened by true religion, which, by calming the spirit, adds to the powers of observation and of reasoning, and is destructive of superstition, and which, moreover, imparts just views of the divine government, the occurrence of epilepsy is productive of awe in those who are gifted with reflection; not as manifesting any disturbance in the established order of nature, but as a striking and salutary evidence of the uncertainty of health, a gift generally prized by mankind above all others.

Paroxysm.—The scream with which epilepsy usually commences is one of the most startling sounds that can be uttered. In female auditors it has produced an hysteric fit, abortion, or as it has been said, eclampsia. We have known it produce in an animal an effect which, although not without something ludicrous in its nature, is calculated to exemplify its astounding harshness. A young lady, while in the drawing-room of an eminent physician, waiting the assembling of a consultation summoned to consider her case, was suddenly attacked with epilepsy. She uttered a scream so piercing, that a parrot, himself no mean performer in discords, dropped from his perch, seemingly frightened to death by the appalling sound.

When, horror-struck by the scream, we turn to the patient, we often find him labouring under a general spasm, more especially of the extensor muscles; his eyes may be discovered fixed and staring, his eye-brows contracted and lowering; he appears to draw back from the beholder with a fixed and threatening look, which, however, it immediately becomes apparent, is but a senseless gaze. The complexion in some epileptics is leaden, in others it is flushed even to duskiness; the muscles are in alternate relaxation and vehement contraction, the spasms being what are called clonic. In a girl who was for some time under our care, so violent were the muscular contractions, that her arm was found dislocated after every fit, until, by a proper bandage, which she always afterwards wore, this accident was prevented. Burserius describes a similar accident, and tells us that he once attended a young lady whose jaw was found dislocated at the end of a paroxysm; and several authors have observed the teeth fractured by the violent contraction of the muscles which elevate the jaw; the tongue is often protruded, and is then almost always bitten, sometimes nearly through; frequently the sides of the tongue, after the fit, are found ragged and bleeding, having been gnawed by the teeth; from the wound in the tongue, the frothy saliva which is forced from the mouth is often tinged with blood; the neck appears swollen; the eyes roll, or are fixed in a hideous squint, which sometimes continues after the paroxysm is over, and even has been permanent;* rapid nictitation takes place, and the mouth is sometimes strangely distorted. The abdomen is distended with flatus productive of borborygmi. The diaphragm, abdominal muscles, and muscular coat of the bladder, overcoming the resistance of the sphincters, expel the fæces and urine with violence, nor is a discharge from the vesiculæ seminales uncommon. The pulse is rapid especially at first, but varies much; it is generally full and strong towards the end of the fit, when sweat flows, especially from the head and neck. The breathing also varies; sometimes it is sibilous, sometimes stertorous; sometimes the lips are puffed out by every expiration; at last the breathing becomes full and uniform. The violence of the convulsions gradually abates, and the strong muscular contractions give way to subsultus tendinum; and at last the patient, perhaps previously heaving a sigh, is restored to a degree of recollection; soon after which, exhausted by the violence of the struggle, he drops into a profound sleep, from which he awakes unconscious of his illness, unless admonished of having had an attack by a severe headach; by the state of the tongue; by discovering that there has been some involuntary discharge, which experience has taught him to connect with the fits to which he is subject; by extreme exhaustion, which may continue for several days; or by discoloration of the skin from ecchymosis similar to that which often occurs in hooping-cough.

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* The following are instances of these contingencies. Puer decem annorum, jam a tribus annis epilepticus, frustra adhibitis multis, remediis, corripitur febre, epidemica, pluribus molestis symptomatibus stipata, et feliciter superat hunc morbum, et postea ab epilepsia immunis manet. Miscell. Cur. Dec. iii. Ann. 7 and 8, p. 296. Fuere quibus excitatus morbus, et nutritus opipara ac desidiosa vita, subita fortunarum jactura per omnem vitiam, haud contemnenda plane compensatione, siluerit. De Haen, pars v. Rationis Med. cap. v.

Death has taken place unexpectedly in a paroxysm of epilepsy, occasioned, as it is thought, by respiration being suspended by spasm of the glottis, or by congestion of the vessels of the brain. [This, however, is not common.]

The attacks of epilepsy are not always attended with so horrible a struggle as that which we have described. Sometimes the patient is seized with sickness or great faintness; his sight becomes dim and uncertain, and recollection is lost, together with all muscular power, so that he slips from his chair or falls from his horse, and when his friends run to his assistance, they find him pale and bedewed with cold perspiration, perhaps insensible, but not convulsed. Occasionally he obtains great relief from vomiting; but generally he continues sick, languid, and confused during the remainder of the day. These attacks may often be traced to indigestion, and sometimes require nothing more for their removal than attention to the state of the stomach.

There is yet a slighter paroxysm to be described, indeed so slight that its nature is generally overlooked by the patient and his friends. It takes place thus: the eyes of the patient suddenly become fixed and vacant: if he be in conversation, sometimes he tries to prolong it in a slow, monotonous, gibbering manner. This attempt, narrowly scrutinized, would seem merely an abortive effort to articulate the last word which he had uttered, and which he mumbles for half a minute or a minute, and then recovering, he takes up the thread of his discourse, being soon aware of an interruption of consciousness, which interruption we have sometimes seen an artful attempt to conceal. Some individuals have described this state as one of great mental distress, of perplexity and depression, like a frightful dream; they have an imperfect reminiscence of some overwhelming calamity, or a sense of remorse for which they cannot assign a cause. This paroxysm is like a short mood of extreme melancholy, at least such an impression the countenance of the patient, which is full of sadness, makes upon the spectator. The returns of these attacks are frequent; they occur several times a day with some. They who are thus affected seldom escape for many days. That this slight and transient attack, which has been called by some French writers "vertige épileptique," is truly an epileptic paroxysm, we are of opinion, from having observed the chain of thought completely broken; from having seen it in persons who had been affected with falling sickness in its severest form; from having known falling sickness affect patients who had suffered under these slighter fits, and from a recollection of the slighter and more severe attacks being alternate in the same individual. This affection is alluded to by Burserius, (Burserius, vol. iv. § 264,) as well as certain other attacks, in which a clonic spasm of only some parts, as of an arm or only of the face, takes place, or in which *all* the senses are not overwhelmed, in the following terms: "There are, moreover, certain degrees of approximation to epilepsy in which the senses are interrupted only for a moment, and scarcely any convulsive motion, or only a very slight one, takes place, the patient not falling to the ground, but continuing to stand. These I should rather name epileptic attacks than actual epilepsy. But if they are neglected, a transition first to epilepsy, and next to that which is severe and perfect in general gradually takes place." Heberden briefly describes this affection as follows: "Postremo animæ defectio levis, quæ modo antecedit justam epilepsiam, modo quasi vicem ejus implet, dum nihil aliud æger sentit præter oblivium quoddam, et delirium adeo breve ut fere ad se redeat priusquam ab adstantibus animadvertatur." (Heberden, Comm. cap. xxxiii.)

The following case of this sub-epileptic seizure was written by the patient herself, (C. S. æt. 37,) and is highly illustrative. "Even when a girl, I was very nervous, sometimes losing all my strength. I have also been liable to a complaint in my liver, for which I was rubbed with mercury. I have had working and uneasiness in my feet, which was quite painful. Now, at times while speaking, or while any one is speaking to me, I get a confusion on the subject about which we are conversing, which used to last for some time, but does not now for more than a minute, and when it is gone I have a most violent palpitation. I have it now much oftener, but it does not last so long. I am told I grow pale round my mouth and look rather melancholy for the time, and fix my eyes upon the person with whom I have been talking. I at the same time work my hands, from having a most uncomfortable feeling in them. I am told I always make a noise in my throat, and moan; but of this I am not conscious, and I seem to be in a tremble, my hands shaking. I am tormented with a pain which goes from my chest to my back-bone, and prevents me from drawing my breath, and gives me an inclination to sigh. From my head to my feet I am at times in pain, and I feel as if there were a heart beating in every part of my body. A numbness comes in my hands, particularly at night, and then I have no feeling in my fingers, till by rubbing I get it back. Occasionally I have had numbness and coldness in my tongue. A lump came in the outside of my throat, which often returns with violent throbbing. This I have every evening."[*] In this patient there was great irregularity in the uterine function. In truth, this was a specimen of uterine epilepsy intermingled with hysteria, which was aggravated by continued anxiety of mind and a diet much too stimulating.

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* Oculorum bulbos incredibili celeritate sub palpebris clausis rotari observatur, unde in musculis oculorum moventibus magna distractio fit, et incurabiles sæpe tota vita oculorum distorsiones manent. V. Swieten Comm. § 1077.

In the much greater number of patients paroxysm of epilepsy occurs without warning,[†] but some are admonished of its approach by symptoms referrible to a disturbed state of the brain or of the external senses, similar to those which are premonitory of apoplexy; as for instance, excitement of the mind; throbbing in the temples; turgescence of the veins of the neck; flushing of the face, with cold extremities; giddiness, weight, headach, drowsiness, forgetfulness; disturbed rest, frightful dreams; irritability of temper, despondency; inarticulate speech; flashes of light or sparks of fire seen in the dark; tadpoles, motes, flies, chains, or cobwebs, appearing before the eyes; coloured areolæ around the candle, or any other luminous body; dimness of sight, or, only one portion of an object distinctly visible; hissing, ringing of bells, roaring of the sea, or other discordant noises heard; strange and unpleasant odours smelt; disagreeable tastes occurring; numbness in the course of a nerve, or tremblings or convulsions in a limb mounting upwards. Watching or delirium sometimes precede a fit, during which ghosts and apparitions are supposed to appear; and as the fit does not always follow the illusion, many of our ghost stories and supposed visions doubtless have arisen from threatenings of epilepsy or of apoplexy. We knew an individual subject to epilepsy who believed that his mother had visited him after her death. Disorders of the digestive organs frequently precede epilepsy, as pain in the abdomen, salivation, sickness, vomiting, looseness. Sometimes the paroxysm follows hysteric symptoms, sometimes obstructed or painful menstruation; or, lastly, the attack follows the *aura epileptica*, which is a sensation as if a current of air, stream of water, or slight convulsive tremor ascended from a part of the body, or of the extremities to the head; when the aura reaches the head, the patient falls down in convulsions. This sensation has first been felt in, and seemingly has arisen from, various parts of the body; from the toe, foot, leg, groin; from the finger, hand, arm; from the bottom of the spine, uterus, loins, abdomen, and chest.

Here we would observe, that the epileptic fit does not always take place when the patient is thus menaced with it [and, very frequently, it is wholly absent]. Premonitory symptoms of epilepsy often occur; not only vertigo, headach, false perceptions, but convulsions in a limb, or in one side of the face, similar to those spasms to which Burserius alludes, with weakness, headach, and a degree of stupor; after which the patient recovers, without the convulsions becoming universal, or insensibility being complete. Dr. Prichard considers these as attacks of partial epilepsy, under which head they are described by that eminent pathologist. To us it would rather appear that, like the aura, they are mere threatenings of a fit.

In some patients epilepsy is congenite, in others it commences in childhood, in others in youth, manhood, and even in age. Sometimes, when previously established, it subsides at puberty; and sometimes, especially in females, the disease commences at that important epoch. There is much variety and uncertainty with respect to the return of the paroxysms. The attacks have been periodic, but much more generally they are irregular in their recurrence. Months, nay years, may intervene between the severer attacks; while the slighter may return daily.[†] We have preserved no list of the epileptic patients by whom we have been consulted, and cannot state the proportion of males to females, but our impression is that we have seen many more of the former than of the latter; hence the observation of Heberden, distinguished for his accuracy, is, we presume, true with respect to epilepsy as it occurs in the upper and middle ranks of society, "Feminæ tamen rarius quam viri in eam incidunt." (Heberden, Comm. cap. xxxiii.)

We have known individuals subject to epilepsy preserve their intellect unimpaired in old age. A very dear friend who was liable to epilepsy, died a few months ago in the seventy-fourth year of his age, whose comprehensive, well-stored, and active mind remained unclouded till within a few weeks of his death. But it is often otherwise; many become corpulent, indolent, dyspeptic; others are affected with paralysis, apoplexy, or veternus, or sustain gradual inroads on the intellect, which lead to amentia, the relations of things being no longer perceived or recollected by them: like mere machines, they act as they are induced to do by external influence; no longer able to originate anything, when they receive an impulse they are carried on as it were by mere habitual training, the power of modifying their conduct by circumstances as they arise being lost. They generally sit all day long staring and drivelling, inattentive to the calls of nature; so that at last their most sanguine and affectionate relatives, despairing of their recovery, become anxious for their death as a release from suffering and degradation. The change which takes place in the expression of the countenance cannot be better described than in the words of M. Esquirol. "Les traits de la face grossissent, les paupières inférieures se gonflent, les lévres deviennent épaisses; les plus jolies visages enlaidissent, il y a dans le regard quelque chose d'égaré, les yeux sont vacillans, les pupiles dilatées. On voit souvent des mouvemens convulsifs de quelques muscles de la face." (Diction. des Sciences Méd. vol. xv. Art. *Epilepsie*). While we transcribe from Dr. Cooke's valuable work on nervous diseases the following descriptive passage from Aretæus, we would have the reader take note that it is applicable chiefly to the extreme cases of the epilepsia cerebralis. "If the disease be of long duration, patients suffer from it even in the intervals of the paroxysms; they become torpid, languid, and dejected; they avoid the sight and society of men; time does not afford any mitigation of their sufferings; they are often oppressed with watchfulness, and when they do sleep they are terrified with horrible dreams; they loathe food, and digest with difficulty; their natural colour disappears, and changes to a leaden hue; they have a difficulty of comprehension on account of torpor of mind and of sense; they are dull of hearing, are affected with a ringing of the ears, and a confused sound in the head; the tongue is unable to do its office, either on account of the nature of the disease, or from injuries which it may have received in the paroxysms; they are agitated by convulsions, and sometimes the mind is so disturbed by the complaint, that persons labouring under it become fatuous or idiotic." (Dr. Cooke on Nervous Diseases, vol. ii. p. 24.)

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[*] Perhaps we may be allowed to observe that a swelling of the thyroid gland, which is often a symptom of hysteria, has not, as far as we know, been sufficiently attended to. This swelling sometimes disappears and returns, but is more commonly permanent; in its external character it is not distinguishable from bronchocele.

[†] Sur cent malades, on en trouve à peine quatre ou cinq dont les attaques soient précédées et annoncées par des symptomes précurseurs. Chez les quatre vingt quinze, ou quatre vingt seize autres, l'invasion de l'attaque est subite.' Georget, Dict. de Médecine, Art. *Epilepsie*.

[†] Heberden relates a case in which there was an interval of thirteen years between the first and second paroxysm.

Species of Epilepsy.—This disease has been divided into the idiopathic and sympathetic species, the former embracing the cases which depend upon an affection of the brain, the latter the cases which depend upon an affection of parts remote from the brain — the epilepsia *cerebralis* and the epilepsia *sympathica*. With respect to the epilepsia *occasionalis*, which is the third species of Cullen, most of its specimens may be considered merely as convulsions symptomatic of other diseases. Thus the epilepsia traumatica, e veneno, e scabie retropulsa, a hæmorrhagia nimia, a debilitate febricosa, ab hydrocephalo, &c. ought to be treated of under the head of wounds, poisons, &c. or if considered not as symptomatic, they ought to rank under the head of eclampsia, an acute disease, of which the paroxysm may never be repeated, and not under epilepsy, which is a chronic disease and recurrent.

It must not be denied that it is not always an easy matter to distinguish between the epilepsia cerebralis and the epilepsia sympathica: the rules for discriminating the one from the other, laid down by authors, are by no means implicitly to be relied upon; and, as the decision of this point is not always practicable, the physician, in the course of an attendance, will sometimes have to change his opinion, for which he ought to be prepared. A dictum of the celebrated Cullen, namely, that in the epilepsia cerebralis there are no premonitory symptoms, while the epilepsia symathica is generally announced by an aura frigida, has not been confirmed by our observation.

In our endeavour to determine the species to which a case of epilepsy belongs, we may proceed as follows:—First, we may inquire into the state of the natural functions—the state of the appetite, digestion, and nutrition, and into the condition of the secretions and excretions; then into the state of the nervous system: and lastly, if the patient is a female, into the functions of the uterus, especially with respect to menstruation. If we are unable to detect any affection of the nerves, any local irritation, or disorder of a part remote from the brain, we may with probability consider the case as a specimen of the epilepsia cerebralis.

In this conclusion we may repose with more confidence, if we discover that the disease is inherited; that the patient has been liable to vascular congestion in the brain from determination of blood to the head, increased action in the arterial system within the cranium, or obstruction in the system of the veins, to be inferred from flushing of the face, throbbing in the temples, epistaxis, vertigo increased by stooping, dulness or weakness of intellect, tightness across the forehead, headach, false perceptions; that there is anything peculiar in the form of the head, or expression of the countenance; and that the habits of the patient have been such as to produce considerable or long-continued excitement of the brain. Paroxysms of epilepsy which occur late in life in persons who have had apoplexy, or whose diathesis is apoplectic; rank under the epilepsia cerebralis; as also do those cases of not unfrequent occurrence, in which epilepsy almost invariably leads to an attack of insanity; cases which differ in two respects from the more common form of periodic insanity, 1st, in commencing with an epileptic fit; and, 2dly, in the mind being much sooner restored to sanity — derangement continuing sometimes only for a few days. It may, however, be worth while to observe, that while differing in these respects, the mental disturbance which follows epilepsy, and *mania periodica*, require the same method of treatment.

Of the epilepsia sympathetica there are five species, viz. that in which the brain sympathizes with a disordered state of the stomach, of the liver, of the nervous system, of the uterus, or with any part of the body suffering from pain or irritation. The following, then, is our arrangement of the subject:—

I. Epilepsia cerebralis.
II. Epilepsia sympathica.
Sp. 1. Epilepsia stomachica.
— 2. — hepatica.
— 3. — nervosa.
— 4. — uterina.
— 5. — a dolore.

1st species.—In addition to many of the common symptoms of indigestion, such as a loaded tongue, unpleasant taste, acid or rancid eructations, cardialgia, heavy breath and perspiration, high-coloured urine, fulness of the hypochondria, and foul discharges from the bowels; the appetite in the epilepsia stomachica is extremely irregular and capricious; sometimes it is defective, often canine, and a sense of distension of the stomach takes place after meals. Even while the demand for food is exorbitant, it will often lie in the stomach undigested for two or three days; this is frequently the case about the time of a paroxysm, shortly after which we have known an enormous quantity of half-digested food vomited, part of which had been eaten at least two or three days before. "Epilepsia stomachica ea est quam fovet et excitat crapula; cardialgiis, ructibus, anorexia, dyspepsia, nauseis, vomitione, prægressis." Sauvages, cl. iv. g. xix.

2d species.—The liver more than the stomach would sometimes appear to be the organ in which this disease originates. Cases have been reported to us in which paroxysms of epilepsy were invariably preceded by change in the complexion, and pain and tenderness of the right hypochondrium; and in which by great attention to the liver, when its function became disturbed, attacks of epilepsy have been averted. We learn from Burserius, that, in certain cases, epilepsy is preceded by pain in the region of the liver, icterus, and symptoms of calculi in the gall-bladder; and from Dr. Prichard, that he has witnessed several cases of epilepsy wherein the symptoms which point out the existence of chronic diseases of the liver were clearly discernible. The following is a brief case of the epilepsia hepatica.

"May 6, 1827. Mr. ———, of a highly scrofulous diathesis, has been affected with epilepsy for several years. The fits commenced at the age of thirteen, and were for some time very frequent in their recurrence; what remedies were employed at first does not appear, but of late he has tried a variety of quack medicines. About twelve months ago, after a rapid succession of paroxysms, he consulted Dr. Casey, of Cork, who found him complaining of pain and soreness in the right hypochondrium, his complexion being at the same time sallow, and his stomach disordered, and by whom small doses of a mercurial medicine and bitters were prescribed, by means of which these symptoms were removed, and there was no return of epilepsy for some months; after which, in November, symptoms of great hepatic disorder returned, of which two paroxysms of epilepsy apparently were the consequence. Since which he has had no paroxysm in a perfect form; but he has experienced symptoms which formerly had forewarned him of an attack, and which he designated a "nervousness," namely a sudden tremor with a momentary but slight convulsion, at which time there was always more or less disorder of the hepatic function; when these symptoms occurred, a brisk mercurial purgative was given, and under this simple treatment he has enjoyed a longer exemption from convulsions than since the commencement of his illness."

3d species.—In pursuing our investigation, we ought next to endeavour to ascertain whether the patient, if a female, is labouring or has laboured under hysteria; whether she has been liable to rapid palpitation of the heart, sudden failure of strength, faintings without loss of consciousness, entire loss of voice, anorexia, or any of the more palpable symptoms of hysteria, as the globus or clavus hystericus. Nay, although there be no symptoms of hysteria, causes which produce that affection may have been in operation prior to an attack of epilepsy, as sedentary occupation in a close and cold apartment, insufficient food, depressing passions; and if so much light may be thrown on the case, through a knowledge of the diathesis of the patient. Nor ought the inquiry respecting the symptoms which characterize hysteria to be confined to the female; for symptoms which no one would hesitate to call hysterical, if occurring in a female, may frequently be detected in males subject to epilepsy, who are of a nervous temperament or hypochondriacal; and hence, that we may include both sexes, this species ought to be called epilepsia nervosa rather than epilepsia hysterica, hitherto the term which has been applied to it.

In patients liable to epilepsia nervosa, there may sometimes be observed preceding a paroxysm, an excessive irritability with jactitation, weakness, tendency to deliquium, suspirious breathing requiring a constant supply of fresh air; or tinnitus aurium, vertigo, and the wildest hysteric delirium.

4th species.—An inquiry into the condition of the uterine function will sometimes discover the nature of an attack of epilepsy, which may be connected with obstructed menstruation or dysmenorrhœa. The epilepsia uterina arises and returns at or about the period of menstruation; sometimes for the first time at puberty, and often in consequence of those causes which check menstruation, as damp and cold feet, excessive fatigue, great anxiety of mind, or alarm. In our opinion this species ought to stand apart from the third species, with which it is generally identified, but from which it differs both in its causes, exciting and predisponent, and in the method of treatment which it requires.

5th species.—To this species of the disease belong cases of epilepsy originating in injuries, in which the nerves are wounded or lacerated, or arising from diseases of the nerves. In the Edinburgh Medical Essays and Observations, (vol. iv. art. 27,) a case of this nature is related, in which epilepsy was caused by a cartilaginous tumour of the size of a large pea, which was situated on a nerve. Upon the excision of the tumour the fits ceased. In the same work there is an account of convulsions being caused by a concretion of the size of a nut pressing upon a branch of the sciatic nerve. One such neuralgic affection we have witnessed, but we rather think the convulsions in that case were not strictly epileptic. To this species, also, belong the affections described by La Motte, in which epilepsy was caused by calculus in the pelvis of the kidney: one epileptic, after a violent paroxysm of the disease, voided five calculi, and had no return of the fits. (Vol. ii. p. 20.) As these cases, however, are rather within the province of the surgeon, we shall not revert to this species of the disease when we come to explain the treatment of epilepsy.

It must be acknowledged that the symptoms which, in distinct groups, give a specific character to a case of epilepsy, are in some instances confusedly intermingled, whereby the symmetry of our attempted arrangement is disturbed, and what is of much more moment, the remedial process rendered difficult by contra-indications: thus it would not be easy to say to which of the foregoing varieties the following case belongs, which is presented, not to discourage the student, who with increasing experience will see more clearly that our division of this important subject is founded on just observation, but to show him that there are difficulties which it will require persevering study as well as the most attentive observation to conquer.

"In the latter end of harvest, 1829, a young lady, æt. 17, who had not begun to menstruate, of a very strumous habit, and much afflicted with psoriasis labialis, having a dry, scabrous, branny skin, and being liable to hysteria in an aggravated form, was visited for the first time by a physician just as she was recovering from a paroxysm of epilepsy, several attacks of which she has since had at the intervals of one, two, or three months. After the first attack there was a sense of fulness and tension in the head, with symptoms of hepatic congestion and torpor, all of which yielded to a moderate bleeding from the arm, together with the use of calomel and pulvis Jacobi, followed by a draught of the infusion of senna and the compound decoction of aloes; and subsequently the shower-bath, and diet of easily digestible materials, together with tonic medicines. Her tongue had usually been coated, the digestive function depraved, as appeared from anorexia and a very capricious choice of food; the alimentary canal very torpid, requiring the continued use of various active purgative medicines. The paroxysms appeared some of them to be averted by a pill of calomel over night and a purgative draught in the morning, so that indigestion seemed to be the chief radix morbi."

Pathology of Epilepsy.—That there will in general be found, on dissecting the bodies of those who have laboured under falling sickness, some exemplification of diseased structure in the cranium, subjacent membranes, cerebrum, cerebellum, or spinal canal, works of morbid anatomy, and treatises on epilepsy, have taught us to expect; they show that after death we may count upon finding a part of the contents of the cranium affected through the operation of some irritating cause. In some dissections is discovered exostosis, or thickening of the bone, which indeed may be a consequence rather than a cause of disease; in others, inflammation or ulceration of the membranes of the brain, of its surface or substance; in others vascular turgescence; effusion of various fluids—bloody, serous, gelatinous, purulent; induration or softening of the brain; tumours sometimes are detected, whether scirrhous, fatty, or sarcomatous; and lastly, tubercles or hydatids: but what *may* be disclosed by any one dissection about to be performed, whether an appearance connected with some change in the structure of the bone, membranes, or the brain itself; nay, whether *any* morbid change will be discovered, a cautious physician would not venture to predicate. The following is one of many quotations which we might produce to show that dissection hitherto has given us but little aid in ascertaining the cause of epilepsy: "Sed et fessi fuerent summi in arte viri, atque in rebus anatomicis peritissimi, quod in cadaveribus hoc morbo defunetorum nihil invenerint sæpe quod culpare poterant." (Van Swieten, Com. s. 1872.)

Even the brothers Wenzel, who have produced a monograph on this subject of the highest order, in which we recognize just principles of investigation, ability, and zeal, after an inquiry continued for a good many years, and the careful dissection of above twenty epileptics, confining their observations to idiopathic epilepsy, to the exclusion of those cases, "*en qui cette maladie peut être produite par des vers ou autres causes extérieures et matérielles,*" and arriving at a conclusion that the disease is seated in the sphenoidal bone, in the pineal gland, and the pituitary gland, but chiefly in the latter, have added but little to the pathology of epilepsy.

Admitting their conclusions to be just, it will not satisfactorily explain the nature of the disease, nor lead to any practical improvement, the great objects to be obtained from the cultivation of morbid anatomy. There seems to have been the greatest diversity in the appearance and condition of the pituitary gland.* Its colour was not uniform, nor yet was its consistence. In some cases it was very soft, and in others preternaturally hard; and in respect of its size and structure there was also great diversity. The Wenzels, we conceive, have merely opened up a new path—a path which ought to be explored by future inquirers notwithstanding the discouraging remark of M. Esquirol, "de toutes ces recherches, particulièrement de celles de Bonet, de Morgagni, Baille, Greding, Meckel, Wenzel, que pouvons-nous conclure? Rien, sinon que ces mêmes altérations ont lieu ches des individus qui ne sont pas épileptiques, comme Wepfer, Lorry l'ont prouvé. Avouons franchement que les travaux de l'anatomie pathologique n'ont jusqu'ici répandu aucune

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* As it would appear from a paper placed in our hands by Dr. Tweedie, which was written by his friend Dr. Sims, of London, that in the French Translation of the work of the Wenzels by M. Breton, ann. 1811, the German word *hirnankang*, which ought to have been translated *gland pituitaire*, has been rendered *cervelet*, we are induced to lay before the reader in this note an extract from Dr. Sims's paper, in which an accurate account is given of the labours of the German pathologists.

"The Wenzels regard as a pathological circumstance a peculiar thinness of the sphenoidal bone and of this part of the base of the skull, when compared with the ordinary thickness of the other bones; variations in the position, curvature, and size of the clynoid apophyses; which destroy the natural symmetry of the bones of the basis, and occasion changes in the capacity and form of the sella turcia. These have an influence on the brain and pituitary gland.

"The pineal gland, in several cases, was altered in colour; in ten it was a pale grey; a brownish yellow vesicle on its upper surface is noticed; in all it was softened; in nine it was much smaller, in two much larger than natural.

"In the pituitary gland the principal changes were observed, some of which certainly would require the close inspection of a practised eye to discover: an unequal and furrowed appearance of the upper surface—in two instances a muscular appearance as in old people; excavations, or loss of substance of the upper surface; depression along the anterior margin; alterations of colour, as various shades of red verging to black, pale grey, yellow, brownish yellow, and pale white. In three cases it was very soft; in five, firm, compact, and of unnatural hardness, considerably enlarged, with an effusion of thick lymph between the two lobes. In seven of prodigious size. The most important alterations existed in the interior: in ten cases, at the point of union of the two lobes, there was a yellow, solid, friable matter, which might be raised in bits; this substance almost always (independent of the separation of the lobes) occasioned a loss of substance. In five cases there was a viscid semifluid lymph between the two lobes. Patches of white, or brownish solid lymph on the superior surface of the gland; the anterior lobe enlarged, and containing a substance resembling pus; the lobes joined without intermediate surface; the lobes separated from each other, the upper surface inflamed.

"In some instances the infundibulum was firmer than natural; in one instance an effusion of lymph resembling false membrane was deposited around a portion of it; in another part it was red and inflamed.

"Several other morbid appearances are noticed. Excrescences on different parts of the basis of the cranium; caries of the bones; effusion on the internal surface of the dura mater, and on the arachnoid lining; variations of the convolutions of the brain, of its magnitude and colour; in the ventricles, corpora striata, thalami nervorum opticorum, tubercula quadrigemina. In fifteen of the dissections, the cerebrum and cerebellum were perfectly healthy.

lumière sur le siége immediat de l'epilepsie." (Diction. des Sciences Médicales, Art. *Epilepsie.*)

[Recent writers — MM. Bonchet and Cazauvielh—whilst they accord with MM. Forille and Delage in their view, that mania consists in acute or chronic inflammation of the cortical substance of the brain, are of opinion, that epilepsy consists in chronic inflammation of the medullary neurine.]

Proximate Cause. — Nothing can be more obscure than the proximate cause of this disease. As convulsions similar to those which attend epilepsy may be produced by the application of an irritant direct to the brain; as every part of the frame is agitated during a paroxysm—all the external senses often being morbidly affected just before the paroxysm, the whole muscular system agitated during it; and as not only the animal but the vital functions are universally pertnrbed, the proximate cause must be seated in the sensorium commune, as being the only part capable of exercising such an influence over the whole body; but the nature of the disorder upon which the epileptic fit depends will probably never be discovered. It cannot be vascular distension, since convulsions are often a consequence of loss of blood, (no other cause at the same time operating,) and may be removed by stimulants. It cannot be vascular collapse, since convulsions sometimes depend upon plethora, and are relieved by spontaneous hemorrhage or by bloodletting.

In this disease we are unable to lay hold of the first link in the morbid catenation. It is generally thought that the aura epileptica is an irritation which first takes place in the sentient extremity of a nerve, and is thence conveyed along the affected nerve to the sensorium, which is thus thrown into disturbed and irregular action, influencing the whole body; but to us it would appear that the aura epileptica is not an irritation of a nerve in the part from which it seems to arise, for then it would take the course of the nerve instead of passing along the integuments; but that it is a reflex sensation, caused by a morbid process going forwards in the brain, or a part of it—that it is a false perception — a mere symptom of an unexplained disorder of the sensorium, as much as tinnitus aurium, or muscæ volitantes, or numbness in a nerve, or pins and needles, as a certain prickling sensation is called by paralytic patients. It would be vain to investigate the essence of a disease, in which there is the utmost uncertainty even in the first stage of our inquiry; in which dissection, instead of affording assistance, rather perplexes us by the multiplicity and diversity of the changes of structure which it discloses. Moreover it would appear that so long as we are ignorant of the nature of the healthy function of the brain, in what manner its influence over the body arises and is maintained, the deviation from the healthy exercise of its function which constitutes the proximate cause of epilepsy must remain sub judice.

Predisponent Cause. — According to systematic writers, the predisposition to epilepsy is supposed to depend on "great mobility," on "a peculiar liability to excitement and collapse;" on "a liability to be influenced by those causes which are applied to most persons with little or no effect." This condition connected with "a greater degree either of sensibility or irritability, it is conceived, is generally derived from original stamina and may more particularly depend either upon debility or upon a plethoric state of the system." We must, however, observe that we have known epileptics, who did not give way to strong emotions upon slight impressions, who were with difficulty excited, and who pursued every purpose with a manly constancy; and hence, without denying that a state, not easily definable, of mobility, is a predisposing cause of epilepsy, we conceive that it is by no means the only predisponent to that disease. An opinion on this subject which we hold, we think will probably not obtain favour; and yet, as it has not been hastily formed, we consider it a duty to put it forward, that it may be verified or disproved by future observers. We conceive that epilepsy is as certain a manifestation of the strumous diathesis as tubercular consumption, psoas abscess, hereditary insanity, or certain congenital malformations or defects of organization which are inherited only from scrofulous parents. Epileptic patients are of the habit of body in which scrofula occurs. We have no recollection of a case of cerebral epilepsy in a patient, who, when due inquiry was made, did not appear to inherit a strong disposition to scrofula. It must be admitted, however, that there are many epileptics in whom there exist none of the more common symptoms of scrofula.

That epilepsy is a hereditary disease is generally admitted. If, when consulted by an epileptic, we make diligent inquiry, we shall find that, although direct progenitors, father or mother, may have escaped, yet some member of the family (uncle or aunt, grandfather or grandmother,) has been subject to fits. As Boerhaave has observed, "silente sæpe morbo in genitore, dum ex avo derivatur in nepotem." If epilepsy for the first time occurs in a family, it has appeared to us that it has been in consequence of the strumous diathesis having been exalted by the intermarriage of two persons inheritors of that condition or tendency of the constitution, and which it has been in a yet more remarkable degree if the parents were of the same blood and nearly related—we may then expect, if an epileptic patient has several brothers and sisters, that his case will not be a solitary one in the family.

[We have no adequate statistics to enable us to settle the question as to the hereditary nature of epilepsy.]

Occasional causes.—Patients, especially those who have had only two or three attacks of epilepsy, are ever ready to consider them as accidental. One attack is brought on by a fright, probably the most frequent exciting cause of the disease; another by over-fatigue; one by confined bowels; another by a strong purgative; one by fasting, another by a surfeit; and it cannot be denied that very many attacks of epilepsy may naturally enough be traced to some inattention to the organs of assimilation, especially in the form of excess in the use of fermented liquors. There was lately in Steevens's Hospital, Dublin, a patient who some twelve or fifteen years ago had a fracture of the skull, which left a depression of the bone. After the accident occurred, he was subject to epilepsy whenever he indulged in the use of intoxicating liquors: at last he was induced to lay them aside, and ever since he has been without an attack of epilepsy, and is now an able-bodied watchman. "I have observed," says Fothergill, "that epileptics are often extremely incautious with respect to diet; that children highly indulged are liable to the disease; that in every other period of juvenescence, and in middle-aged adults, if they were attacked with the disease, it was when they had either committed some excesses, or by one means or another were plethoric; and that in habits subject to epilepsy, the disease seldom recurred without either an habitual indulgence in eating, or a neglect of necessary exercise."

The occasional causes of epilepsy may be divided into two classes. 1st. Joy, anger, suppressed discharges, repelled diseases, elevated temperature, bodily over-exertion, drunkenness, prolonged sleep, surfeiting, congestion of the bowels, obstructed or painful menstruation. 2. Opposed to these are terror, grief, disgust, exhaustion of mind from intense application to business or study, vigilance, inanition, hypercatharsis, venereal excesses, hemorrhage. "Parmi les causes excitantes de l'épilepsie la frayeur tient à-coup sur le premier rang. La colère et un chagrin profond, la masturbation, et les excès vénériens paraissent, après la frayeur, tenir le premier rang parmi les causes de l'épilepsie." (Diction. de Médecine, Art. *Epilepsie.*) We read of epilepsy being caused by imitation. An attack of epilepsy, when witnessed by a number of unmarried females in a church or school, has often led to convulsions spreading from one to another, till a great many are affected. Dr. Whytt describes this affection in the following words: "There is a disease very common in the islands of Zetland, which is known there by the name of the convulsive fits. It begins with a violent palpitation of the heart; soon after which the patients fall to the ground, unless they are supported; their arms and legs are alternately contracted and relaxed; and in some cases their joints become so rigid that they cannot be bent. Their respiration seems to be difficult, and they cry terribly while the fit lasts, which is generally less than a quarter of an hour. This disorder seldom attacks married women; but young women, and even girls of ten or twelve years of age, are liable to it. Some boys and two young men in these islands have also been affected with it. In the church or other public meetings, as soon as one is seized, all such as have formerly been subject to the distemper are attacked with it, which often occasions great disturbance." These attacks, there cannot be a doubt, are not epileptic, but, like certain more recent exhibitions in churches, are clearly referrible to sympathetic hysteria.

[A recent writer, M. Meyer, has published some cases of what he terms *epidemic epilepsy*, occurring in schools. In consequence of a girl being attacked with epilepsy, numerous others became affected. Most of the girls were approaching the age of puberty, and they were all of a highly excitable temperament. It is probable, indeed, as the writer has stated elsewhere, (*Practice of Medicine*, ii. 230,) that these were cases of hysteria rather than of epilepsy. Many cases, however, are on record, in which the disease appears to have been produced by the sympathy of imitation from witnessing a paroxysm in another.

An idea has long existed, that the paroxysms of epilepsy may be connected with the condition of the moon; but there does not seem to be any sufficient reason for this belief.]

Of the occasional causes of epilepsy, it is justly observed by Dr. Cooke, that "some are stimulants producing an increased action of the brain, while others are sedatives, operating so as to diminish its energy." When there is a predisposition to epilepsy, a cause of either kind, productive either of excessive or defective action, may interrupt the equable transmission of the sensorial power by means of the nerves, and thus occasion a fit; and hence it would appear desirable to retain every patient who is subject to epilepsy in a state equally distant from plethora or from undue emptiness of the cerebral vessels.

[Perhaps disorders of the digestive canal, while a predisposition to epilepsy exists, are the most common exciting causes; and, accordingly, we often find the paroxysms recur as certainly as aliment, improper by character or quality, is received into the stomach. In such case, the disease is "*eccentric*" epilepsy.]

Diagnosis.—We have reason to think that not only eclampsia, but hysteria; cataleptic hysteria; sympathetic hysteria, the disease of religious sects among whom enthusiasm is permitted to usurp the place of sobriety; catalepsy; catalepsis delirans; extasis, have been considered as specimens of epilepsy. The student, therefore, must acquaint himself with these diseases, as also with the history of feigned epilepsy, which, not merely in the military hospital but in private practice, he may be called upon to distinguish from the genuine disease. Let him bear in mind that if a fit commenced with a scream, if it was characterized by insensibility, convulsions, and foaming at the mouth, if it ended in sopor, and if the tongue were wounded or even gnawed at the edges, there can be but little doubt that it was epileptic.

Prognosis.—The prognosis in epilepsy embraces two heads of inquiry, viz. first, the danger to be apprehended from the paroxysm; and secondly, the probability of a return.

As epilepsy sometimes proves suddenly fatal during a paroxysm, our opinion must be delivered with a salvo in reference to such a contingency. To form a judgment of the amount of danger, we must, first, endeavour to ascertain the species of epilepsy to which the case belongs; cerebral epilepsy being attended with more danger than nervous, nervous than gastric or hepatic, and these again than uterine: but we must not forget that the sympathic species of epilepsy may, by repetition, acquire the character of the idiopathic, and be attended with equal danger. Secondly, we may oftentimes judge of the danger of the attack by the symptoms which precede it; thus, in the cerebral species, danger may be apprehended when the preceding symptoms indicate a fixed disease of the brain, as intense pain, vigilance, delirium; when inroads have been made upon any of the mental faculties; and when there have been threatenings of paralysis. Thirdly, we are influenced by the violence and duration of the paroxysm. Those severe paroxysms which continue many hours often terminate in fatal exhaustion, or in an apoplectic state. Hence coma, after the convulsions, is truly alarming, as it shows that apoplexy has actually begun.

The probability of the return of the fits will, in like manner, be greatest in cerebral epilepsy, than in nervous, next in gastric and hepatic, and least in simple uterine. In cerebral epilepsy the fits will with most likelihood return in the cases in which the disease is inherited, in which the patient has a peculiarity in the configuration of his head and expression of his countenance, and which have been long established. Of the epilepsia stomachica and hepatica, the cases will probably be most obstinate which exist in connection with habits of self-indulgence and with weakness of character. Of the epilepsia nervosa the stamina of the patient will in general decide our opinion both in respect of danger and repetition; indeed, in every species of epilepsy recurrence will be more probable in a constitution defective in point of original vigour, or impaired by excess. In the epilepsia uterina we have most hopes of ultimate recovery, inasmuch as epilepsy will frequently cease when a change takes place in the function of the uterus; as, for example, at the appearance or reappearance of the menses, at marriage or during pregnancy,

We are inclined to think that epilepsy will be found more inveterate when it occurs in patients who are affected with chronic cutaneous affections. To lepra, psoriasis, ichthyosis, and porrigo, epileptics are peculiarly liable.

Treatment.—In general, a physician now-a-days may unreservedly explain his views, to such patients as are possessed of good sense and temper, of the nature of their malady and the remedial process about to be employed,—nay, in some instances, may explain the doubts which are suggested by the former, and the uncertainty of the latter, while at the same time the solid ground on which he builds his hope of achieving a cure is clearly pointed out. But such a procedure with nervous patients would be highly injudicious. Not only are such patients, by constitution, infirm of purpose, but by disease are they often rendered additionally irresolute, and, in consequence of the fears which disease engenders, they are a prey to every pragmatical relative or acquaintance or volunteer prescriber, who may choose to insinuate doubts and apprehensions, suggest the necessity of changes, and damp and disconcert the medical attendant.

When he undertakes the treatment of a case of epilepsy, the physician ought in the first place to study the patient's disposition, in nervous illnesses it being generally of as much importance to distinguish the shades of character as the shades of disease; and, having penetrated into the interior of his patient's mind, he must there obtain an ascendency not merely by knowledge of disease, but in virtue of that influence which is generally obtained by calmness of manner and consistency and decision of conduct. We venture to hazard an observation with respect to physicians of equal skill in the medical treatment of nervous diseases, that they who are not communicative will be more confided in and more successful than they who think aloud and explain all their views and plans.

It would lead us away from our subject, otherwise we could easily show the necessity that the physician is under of acquiring and retaining a complete control over the mind of his epileptic patients, and of inspiring them with hope. We may be permitted to state, in support of this observation, a fact which we have often witnessed, namely, the temporary advantage which is generally derived from a change of measures. When an epileptic patient is placed under the care of a confident empiric, or of a physician who is in great repute, the disease will often be suspended for a considerable time, and to the eye of a sanguine person appear cured; while on the other hand, after a long suspension, when the disease returns, such disappointment is produced as to fill the patient with the gloom of despair, a state of mind which would seem to renew the energy of those causes upon which the fits depend, and hence they occur at shorter intervals and with greater violence than ever.

The empiric, well knowing how much depends on confidence, has various methods of fixing unstable minds; he cajoles and blusters, and with equal power of fulfilment he promises and threatens; he knows that he may draw upon the imagination of his patient to any amount, and that his draft will be honoured; that the mystery with which he clothes all his measures is often the cause of his success, and hence he provides his own remedies, and invests them with supposititious activity. Give a patient a few grains of liquorice-powder, and let him be told that he has just swallowed part of the skull of a malefactor, (which once was considered a sovereign remedy for epilepsy,) or that this powder contains a substance of which, according to the German dreamer, a thousandth part of a grain is the proper dose, and you often may thus cure a disease which is any thing but imaginary. In Ireland, epilepsy has often been cured by the priest, who is supposed by the credulous of his own communion to be gifted with the power of working miracles of healing, a power claimed for the Roman Catholic Church, even by her most enlightened members. Uneducated adherents of the Church of England, and even the presbyterian, both in such matters equally credulous, often successfully apply to the same functionary to be cured of fits. He sometimes begins the curative process by giving two or three very powerful emetics; but he chiefly relies upon obtaining dominion over his patient's mind, an art in which he is often eminently skilled, and which he is the better able to practise, as probably he implicitly believes in his own supernatural power. If the epileptic be a Protestant, the priest signifies that the prayers which he offers up, the virtue with which he is endowed, are his, only for the benefit of the members of his own church; the patient, over-persuaded probably by his friends, goes to mass with reluctance, as a temporary expedient to qualify him for the intercession of his spiritual physician, by which means the latter gains an advantage over the disease. A struggle has taken place in the patient's mind, in which conscience is laid prostrate; a great and permanent moral impression is made, which, especially if the disease is nervous epilepsy, sometimes ends in the fits being suspended, and the patient becoming a devoted adherent of the Church of

Rome, to whose interests, by his belief in the superhuman power of her clergy exercised in his behalf, he becomes more attached than if he had been born within her pale; and confidence in the agency through which he has obtained relief, we doubt not, sometimes renders it permanent. Such is the nature of modern miracles, and such the principles by which even protestant clergymen have been enabled to take a part in a farce equally disgusting to all who are able to distinguish between true religion and superstition.

A successful empiric, who by various practices had for a long time sustained the hopes of a young lady who was afterwards under our care, one day observed her, while under a sense of faintness, having recourse to sal volatile; this he eagerly snatched from her, and throwing up the sash he violently dashed the vial upon the pavement, at the same time declaring, with well-affected displeasure, that if he ever heard that she had any medicinal substance in her possession which was not given to her by himself, he would never see her again, as his remedies were so delicately combined, that, by admixture with any other drug, their efficacy would be completely destroyed.

When the extrinsic occasional causes of epilepsy are removed or guarded against, the paroxysm, as depending upon associations established within, will often return with equal violence. Against epilepsy thus become habitual and almost periodic, well sustained hope, whether rational or but a "fair fallacy," as were the amulets employed of old, will be found more efficacious than any other condition of the mind. Sudden alarm, indeed, has been called into assistance as an anti-epileptic remedy; but, with Dr. Cooke, we agree in thinking that terror cannot be employed in the treatment of epilepsy, as being a remedy not sufficiently under control. From the annals of medicine we learn that there were other influences formerly much in vogue, which, acting upon the mind alone, must have produced permanent feelings of disgust; as for example, the following medicines, which may be considered as a curious specimen of the articles of the Materia Medica which, in former times, were derived from the animal kingdom:—Cineres talpæ, muris, corvorum; hepata ranorum; testicula et urina apri; dentes humani pulverisati; hepar hominis comestum; sanguis hominis recens occisi; sanguis patris; secundina humana; stercus humanum: There are other abominations of the same kind, unnecessary to specify, the use of which, Erastus alleges, was taught to mankind by the devil; but without calling in question the active malignity of our great enemy, we are of opinion that man, when left to his own inventions, is fully equal to the discovery of these and a multitude of other therapeutic agents of equal ineptitude.

We have known regular physicians, aware of the advantage which may be derived from keeping the imagination under the agreeable excitement of hope, practise upon the credulity of their patients, as we conceive, very unworthily. We once possessed a prescription written by a physician of some name in Paris, in which the chief remedy prescribed by him was a polished piece of jasper or jade, which he ordered to be inserted under the skin of an epileptic patient's arm. Had he ordered the words of power which were supposed, by believers in the art magic, to be inscribed on the ring of Solomon, or any other talismanic characters of equal value, to be engraved on this anti-epileptic fossil, his charlatanry would have been more perfect. The regular physician must not practise deception even to forward the interests of benevelence, but he may practise reserve, which will often answer better than all the mystifications of the empiric. Let it be matter of agreement, when he undertakes the treatment of a case of epilepsy, that the patient shall not know the nature of the medicines to be prescribed. Were we, in certain cases, to send our prescriptions to the apothecary sealed up, the medicines so ordered would produce effects which would surprise even the prescriber himself.

It would be superfluous to dwell upon the importance of diet in the treatment of chronic diseases. In such diseases great improvement will sometimes arise from mere change of diet, how unobjectionable soever the diet may have been formerly. If, however, a change is recommended when the individual first comes under our care, it behoves us to explain the reason of the change; let us not, as some have done, change a patient's diet in such a manner as to abate his confidence in his former physician, who may have treated his case with judgment.*

It is needful to stipulate that our patient shall no longer yield to his appetite or inclination. He must move by fixed rules. He must eat only what is placed before him by order of his physician, not asking to have his food varied or enlarged. We do not exaggerate when we affirm that not one individual in ten, labouring under chronic illnesses, strictly observes the rule of diet which is appointed for him by his physician. Drunkenness, in the middle ranks of society, is much less prevalent than formerly, but epicurism in eating much more so. The affected delight with which some popular writers have expatiated on the refinements and indulgences of the table has been, we fear, supposed real, and has given a stimulus to sensuality much to be deplored, especially among young men, many of whom now put no restraint upon their appetite for rich and savoury food, while on the pleasures of the table they descant as shamelessly as if they were fit only for the society of Apicius. In general there is no difficulty in persuading patients to relinquish intoxicating liquors, which, as almost every sensualist is aware, seldom fail to produce painful exhaustion in proportion to pleasurable excitement, and which are well known to unfit those who habitually indulge in their use for animal gratifications which are more prized; but very great indeed is the difficulty which we encounter in securing a strict acquiescence in our injunctions with respect to food; and if this cannot be accomplished, it would be well that the physician at once should decline the care of an epileptic patient.

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* Some practitioners living in a thoroughfare, or in towns in which the population is constantly fluctuating, thinking that the character of their professional brethren at a distance is a matter in which they have no concern —thinking, moreover, that any means of advancement is lawful—abruptly change the measures of their predecessor in attendance, as it would seem, to obtain confidence at his expense. If, for example, a dyspeptic patient has been permitted to take animal food only once a day, they will order it to be taken at every meal. Change of air, of occupation, a mild purgative regularly taken, and perhaps even, for a limited time, a full diet after a restricted one, will often produce a sense of great improvement, which it is generally thought by the patient himself might have taken place earlier had his former physician been more skilful. The patient returns home full of erroneous opinions relative to diet, soon to experience an aggravated return of his sufferings, and fondly imagining that there is but one physician in the land who understands his case. Innumerable are the phases of quackery, inasmuch as it is applicable to every species of credulity and mode of folly.

Having paid some attention to the proceedings of empirics, foreign and indigenous, regular and irregular, we venture to say that we may sometimes be taught by them useful lessons; and we ought not to decline assistance even from such sources: in this case the end will justify the means employed. There was some years ago, in Dublin, an outlandish person, said to be from Germany—a high German doctor, although by some it was alleged that he was a native of Ireland, and born in the *kingdom* of Kerry—who professed to cure epilepsy. His appearance was such as to strike a vulgar mind with awe, while one who had pleasure in the grotesque or fantastical, or a taste for the antique, could scarcely help being amused by the public exhibition of an individual who apparently belonged to an earlier and more rude and credulous age of the world. With measured pace and serious aspect he paraded those parts of the city which are most frequented, displaying what the refined taste of our youth has rendered no longer a novelty—a beard like that of an adult goat; behind him, almost in lock-step, there marched a tall fellow in a gaudy livery—light blue, abundantly tricked out with silver lace. Jan Stein, the shrewd observer of water-doctors and mountebanks, never painted a more characteristic pair than the solemn leech, whom we have slightly sketched, and his self-important follower. At first, trade was brisk with this adventurer; but he soon left Ireland, having discovered, to borrow an illustration from the agriculturist, that ground made to yield too rich a crop is thereby soon impoverished; and probably he also found that in no community is there a keener perception of the ludicrous or a juster estimate of character than among the more respectable part of the inhabitants of Dublin. He held some of the opinions of the Nazarite, for he told his patients that they must not cut their hair, "in which," he generally added, "lay the strength of the body," and he inhibited the use of wine and all intoxicating liquors, a restriction not calculated to advance his reputation in Ireland. But to have introduced this original to the reader would be mere impertinence, were it not that there was a point in the regimen which he prescribed worthy of adoption. He ordered his patients to walk, those who were not enfeebled, twelve, fifteen, or even twenty miles a day. They were to begin by walking a moderate distance, and they were gradually to extend their walk according to their ability. In some of his patients a great improvement took place, both with respect to digestion and muscular strength, and this was so apparent in a short time, that ever since this luminary shone upon the metropolis of Ireland, most of our patients, affected with epilepsy, have, by our advice, been peripatetics. We recommend those who are subject to this disease to walk as far as they can without much fatigue. We do not prescribe one long walk, but several in the course of the day, of moderate length. Delicate females have thus been trained to walk eight or ten miles, by making them sit or recline when they were fatigued, and again move on when rested. Females of the hysteric diathesis, who are liable to epilepsy, must pass as much of their time as possible *sub dio*, driving, boating, or even sitting in a sheltered place, if they are unable to walk without being fatigued, muscular exhaustion being generally hurtful to them.

In prescribing a rule of diet suitable to all epileptics, moderation in quantity and simplicity in the preparation of food are indispensable points. If the diet of an epileptic has been either too high or too low, it ought to be changed. We conceive the diet which would best preserve an individual liable to scrofula from an attack of that disease, would be best suited to a patient liable to epilepsy. Fermented liquors, however, should be in general altogether withheld. Flesh meat ought to form the principal part of one if not two meals in the day; and milk, if it agrees, that is, if it does not retard digestion, which it is less liable to do when fermented liquors are laid aside, is the article next in value. The epileptic ought to be trained so as to be in good wind, or, in other words, his muscles ought to be in a state of the utmost strength and firmness. If we permit ourselves to take a lesson from empirics, we may surely avail ourselves of such information as may be derived from a brotherhood at least as respectable, namely, the gentlemen of the *fancy*, as they are called, or we may have epileptics trained as were the athletæ in ancient times.

When the patient leaves his bed in the morning, he may have a rusk or a slice of toasted bread with an egg beat up in a teacupful of warm milk and water; then let him dress, make all needful arrangements, and walk three or four miles. Two hours or more after he has left his bed, let him have his second meal,—milk, or cream in water, or cocoa, with bread a day old and good butter. It may be observed that wheaten flour is very generally adulterated with bean and potato flour, both of which injure the quality of bread, and that butter is much oftener rancid than good. Let the patient rest for three hours after breakfast, and this will be the best time to devote to business or education. Then he must again walk, if an adult possessed of sufficient vigour, from five to eight miles. At from five to six hours after his second meal let him have a third, consisting of meat of the best quality,—mutton excluding fat, poultry, game, or very tender beef, roasted or boiled, of which an adult must not eat more than six ounces; bread, and one moderate helping of tender well-boiled vegetables; of drink—not more than a common tumblerful must be taken, distilled water, Seltzer water with a little milk, or toast and water, being equally proper. Then the individual may rest for two hours, but we would not have him lie after meals as some have recommended, this having appeared to us to retard rather than to promote digestion, probably by disturbing the circulation: he may stroll in a garden, read an amusing book, or chat with an agreeable friend, only such occupation being permitted as will not raise the pulse by one beat; he may then resume more active exercise for an hour or two. In five or six hours after dinner a light supper may be taken, consisting of not more than four ounces of meat with bread, or a cup of milk with a water-biscuit. The rest of the evening may be spent in cheerful society, in a large airy room, not over-lighted nor overheated, but sufficiently warm to prevent that chill which in the latter part of the day often follows very active exercise; and every occupation by which the mind is depressed, or is excited and thereby subsequently exhausted, must be avoided. The patient must be in bed at eleven and up at six, nothing in general being more hurtful to epileptics than sleep unnecessarily prolonged.

The scalp in all epileptics ought to be shaved once a week, (a few ringlets at the temples and in front being permitted to grow,) and daily well rubbed with a flesh-brush after the tepid shower-bath, or what answers nearly as well and gives less trouble, after pouring a flagon of tepid water on the head inclined over a large basin. The hat or cap worn must be of the lightest kind, a straw hat, or a light foraging-cap of cloth, which may be replaced, when within doors, by a nightcap of woven silk worn single. The patient may gradually bring himself to sleep without a nightcap, and without curtains, both of which lead to effeminacy; with his shoulders and head raised and his feet well protected from the cold, in a chamber as large and airy as possible, and without a fire; there may, however, in winter, be a fire in his dressing-room, or his bed may be warmed. The temperature of his extremities must always be supported by means of exercise, friction, or proper clothing.

A patient liable to epilepsy must not be permitted to ride, or to hold the reins in a carriage. The grates in all the apartments which he frequents ought to be guarded by a deep and strong fender; he ought to avoid the streets of a crowded city, in which the whirl of carriages, the tide of human beings, the stunning confusion of sounds, and the multiplicity and distraction of objects, produce a vertiginous hurry of thought, which to him is ever dangerous. He ought not to walk near water. One of our earliest patients, a fine young man of twenty, came to an untimely end in his own garden, by falling into a runnel, in which he was drowned, although the water was not more than four inches deep. Lastly, if his circumstances admit of his having an attendant, the epileptic ought never to be alone. His companion ought to be provided with a nervous draught, consisting of camphor mixture and ether or ammonia, by taking which there is reason to think that the paroxysm may be averted in the gastric or nervous species of epilepsy; with a wedge of soft wood to interpose between the teeth; with a piece of broad tape to be applied to the superior part of the limb, if the paroxysm should commence with the aura in the extremities; and with an air-pillow to inflate, and place under the patient's head, when he is attacked in the open air. If the attack takes place in his chamber, the patient ought to be laid on his back on a French bed, with at least one attendant standing on either side to prevent him from injury during the struggle. If he is much flushed, his head and shoulders ought to be elevated, the warmth of his extremities supported, while at the same time air is freely admitted into the room. All attempts to make him swallow, or to stimulate the nostrils, are improper. A medical practitioner ought to be sent for and ought to remain in attendance while the struggle lasts. In a first attack, if the fit is severe, blood ought to be procured from the temporal artery, a precaution which will also be necessary in patients of an apoplectic diathesis, whensoever they labour under a prolonged fit of epilepsy.

[Compression of the carotids has likewise been found serviceable, not only in the way of prevention, but during the paroxysm.]

Most of the foregoing observations apply to every case of epilepsy. Having endeavoured to determine the variety to which the case belongs, a point in general overlooked by the nostrum mongers, we have now to point out the specific treatment which will be required. We are in the first place to ascertain whether there exist any symptoms of present danger; and, secondly, to apply ourselves "to the more continued treatment required in the disease considered as a chronic affection." (Prichard.)

Epilepsia cerebralis. — If the case belong to cerebral epilepsy, we must endeavour to discover the condition of the vessels with respect to increased action or congestion; if in a state of excitement or turgescence, they must be relieved without delay, by means of general or local bleeding, or by antimonials, with mercurial purgatives, and the antiphlogistic regimen. At every paroxysm, as soon as the patient awakes from that sleep which is part of the crisis, he ought to be examined with care by a medical practitioner. We conceive, were this uniformly done, and the necessary treatment immediately adopted, that in many instances the subsequent attack would be milder and more distant, the faculties of the mind would be less endangered, and the probability of ultimate recovery would be greater. Many chronic affections are merely a series of imperfect recoveries from attacks of acute diseases. This we have seen exemplified on a large scale in the House of Industry in Dublin, which in former times was filled with paupers, the victims of poverty and intemperance, mostly labouring under chronic disorders of the viscera. Many of these outcasts from society passed much of their time in the subsidiary hospitals, to which they were sent when they were affected with febrile attacks, of which a considerable portion of them died; each recurrence of fever assuming a darker complexion in consequence of recovery from its precursor being incomplete. In epilepsy, if due attention were paid after every return of the convulsions to establish the fact of perfect recovery, we are persuaded that the patient might often preserve his place in society, instead of becoming from chronic disease of the brain, originating in or aggravated by the severe paroxysms, a mere driveller, as is the lot of many an epileptic in the latter part of his life. And this view is strengthened by the fact that some patients are reduced to idiotism, not so much by the natural course of disease as by vicious habits in which they indulge, which not only confirm the predisposition to epilepsy but injure the brain and nervous system: "L'abus des liqueurs alcoholiques, les excès vénériens, et la masturbation aggravent l'épilepsie et precipitent la perte de la raison." (Georget, l. c.)

The paroxysms of epilepsia cerebralis chiefly occur, to use an expression of Fothergill's, "in the plenitude of health;" and when this is the case, we may pursue the plan about to be recommended with more confidence.

In treating this form of epilepsy we apply the principle of revulsion, explaining that term, not as the driving back of the fluids from one part to determine them to another, but simply as expressive of the relief to be obtained for an organ in which a morbid process is going forward, by inducing a more vigorous state of the circulation in other organs, or by the establishment of a process of counter-action in a remote sympathizing part. With this view we have to recommend, first, once a month the cupping-glasses and scarificator to be applied to the nucha, and a few ounces of blood to be by that means taken away; secondly, dry-cupping to be practised between or over the scapula every third or fourth day, two cupping-glasses to be allowed to adhere for a quarter of an hour; thirdly, a caustic issue (which is less troublesome and painful in dressing than a seton) to be made in the back of the neck where the seton is usually inserted; and, lastly, once in the week, a moxa, or a blister, not larger than a crown-piece, to be applied to the back of the head, behind the upper part of the ear, where there is space for a succession of four such blisters. If a blister be preferred to a moxa, let it be put on at noon, and it will be ready to be dressed before bed-time, by which means the patient's rest will not be broken, as it generally is, by a blister, however small, applied at bed-time. There is abundant evidence of epilepsy being moderated while a discharge has been maintained, from a sore either accidentally occurring or designedly produced, and being aggravated almost immediately after such discharge has been dried up.

In epilepsia cerebralis we wish to promote a more active circulation in the muscular tissue, and in the integuments, especially of the limbs, which is to be done by champooing and frictions, while the head is kept cool and the shower-bath taken daily. Our hope of cure in this form of epilepsy chiefly rests on persevering attention being paid to diet and regimen, and on topical means; yet although our confidence in the use of internal medicines is not so great in this as in the other species of the disease, they are not to be dispensed with, when the functions of the cutaneous, gastro-hepatic, or nervous systems are disordered

Antimonials are requisite when the skin is inactive, and we have known signal benefit afforded by antimony to those persons who, in advanced life, have laboured under the apoplectic epilepsy, as it has been called. The preparation of antimony which we prefer is James's powder, the pulvis Jacobi veri, and the following is the method of exhibiting it which we recommended a good many years ago, and which has often been adopted since with advantage. (Dublin Hospital Reports, vol. i. p. 315.) The patient is to begin with a very moderate dose of the powder, not more than two or three grains at bed-time, and to increase the dose by half a grain every night, till some sensible effect is produced on the skin, stomach, or bowels. Should the stomach at any time be affected with sickness, the dose may be lessened by a grain on the following night. By the addition of a few grains of rhubarb, a larger quantity of James's powder may be administered than the stomach could otherwise bear. If the skin be affected, the dose should not further be increased, but it must be repeated every night for about three weeks; it may then be reduced as it was augmented by half a grain every night, the course occupying a period of at least six weeks. We have known eighteen or twenty grains taken every night for a considerable time without inconvenience, and even when not productive of any sensible perspiration, it has often allayed the heat and restlessness which so often accompany irregular determinations of blood. In very cold weather we have directed the patient to make some addition in point of clothing, but have not confined him to the house even when the snow was on the ground; as we do not consider the system to be more susceptible of catarrhal or rheumatic affections while under the influence of James's powder. To this course of medicine the tepid bath will prove a valuable addition.

If there be any of those scaly affections of the skin to which epileptics are so liable, a draught as follows may be taken:

℞ Radicis sarsaparillæ concisæ, ℥i.
Radicis glycyrrhizæ concisæ, ℥ii.
Aquæ calcis, uncias x.

Macera in vase clauso, subinde agitans, per horas duodecim, dein cola. Divide in haustus sex. Sumat unum ter quotidie.

When the eruption is not attended with inflammatory heat or itching, the aqua picis liquidæ may be given to the extent of from half a pint to a pint in the day, or as a substitute the pilulæ piceæ.

In indigestion with a loaded tongue, the nitro-muriatic acid may be deserving of a trial, two or three minims of the nitric acid, with four or five of the muriatic, in three ounces of distilled water, may be sucked up through a glass tube or a reed, at least three times a day. Where the breath is heavy, the following powder may be given.

℞ Pulveris recentis carbonis ligni, gr. xv.
Pulveris rhei, gr. ii.
Pulveris ipecacuanhæ, gr. i. M.

F. Pulvis e cyatho vin. aquæ cinnam. bis quotidie sumendus.

If the urine be scanty, with a red sediment, a drachm of Brandish's alkaline solution in water, or an alkaline bitter draught, may be taken every forenoon and evening. We do not object to the occasional use of mercury, but we have never, in this form of epilepsy, willingly given that mineral so as to affect the mouth. If the bowels are confined, one of the following pills may be given at bed-time:

℞ Extracti aloes,
G. galbani, sing. gr. ii.
Saponis duri, gr. i. M.

Or the following powder, which was the favourite aperient of a Dutch empiric, who undertook the cure of epilepsy:

℞ Sulphuris loti, ℈i.
Sulphatis potassæ, gr. x.
Pulveris rhei, gr. v
Pulv. nucis moschatæ, gr. ii. M.

Lastly, if the nervous system be irritable, the patient desponding and apprehensive, the treatment to be recommended under the head of Epilepsia Nervosa will probably afford relief.

Epilepsia Stomachica.—We once had a patient who, in the early part of his life, had been under the care of the celebrated Dr. Cullen. Dr. Cullen kept him in a state of unceasing nausea for a very long time,—our impression is, for more than a year,—and without the slightest relief. It is not so that we would have emetics employed. We conceive that attacks of epilepsy may sometimes be parried by giving emetics at stated periods, and we have been accustomed to prescribe the following emetic in this form of epilepsy, once in the week:

℞ Pulv. ipecacuanhæ, gr. xv.
Sulph. zinci, gr. v. M.

Two cases of the epilepsia stomachica were successfully treated by giving, once a week, a calomel bolus at bed-time, and on the following morning a draught containing castor-oil and oil of turpentine in the following doses:

℞ Olei ricini, ℥iii.
Olei terebinthinæ, ℥ii.
Mucilaginis acaciæ ℥iii.
Aquæ menthæ viridis, ℥vi. M.

To the best of our recollection, both patients had a pill of aloes and soap every second day, took bitter medicines, and had their diet regulated with great care, more especially with regard to quantity.

In this form of epilepsy, the bowels ought to be completely emptied, every second day, by means of a dinner-pill, and the use of the injection syringe.* The dinner-pill may consist of two, three, or four grains of the pilulæ aloes compositæ, or the pilulæ aloes cum myrrha, or of the pilulæ stomachicæ Mesues, now by an altered name, contributing to the medical fame of Lady Webster, and which owes its efficacy solely to the aloes which it contains, and to its diffusion among a mass of solid aliment. A pilula ante cibum ought not to contain more than a grain and a half or two grains of aloes, or to be taken every day. The injection may consist of a pint or more of tepid or cold water, with or without two or three drachms of the muriate of soda.

Once every week the bowels ought to be fully evacuated by giving at bed-time a medicine acting upon the liver, stomach, and small and great intestines:

℞ Hydrarg. submuriatis, gr. ii.
Pulv. ipecacuanhæ, gr. i.
Pulv. rhei. gr. iv.
Extr. aloes, gr. ii. M.
F. pilulæ ii. hora somni sumendæ;

and the following morning before breakfast, a saline aperient draught.

At the same time the patient must have a tonic medicine, twice in the day, containing half an ounce or six drachms of the atramentum Heberdenii, now introduced into the Dublin Pharmacopœia under the designation of mistura ferri aromatica, or an ounce of the mistura ferri composita, or the following draught:

℞ Sulph. ferri, gr. iii.
Sulph. quiniæ, gr. i.
Infusi calumbæ, ℥i.
Ac. sulph. dil. *m.* iii. M.

It is in this species of epilepsy and in nervous epilepsy, that benefit may occasionally be obtained from the nitras argenti and cuprum ammoniatum. In the cerebral species we have repeatedly tried the former medicine, in the dose of nine or ten grains a day, for a sufficient length of time, without the slightest benefit.

Among the means most likely to improve the state of the digestive system, there is not any which is so uniformly beneficial as change of residence and travelling, and the improvement is often felt for many weeks after a movement. Journeys, in the case of the epileptic, who naturally dislikes to expose his infirmity to strangers, ought to be undertaken shortly after an attack, as a considerable period of time generally elapses before the fit may be expected to return. It would appear from the following observation, made by De Haen, that changes of residence and long journeys have sometimes cured the disease. "Etiam mutatione domicilii, diuturniore peregrinatione, vitæ genere prorsum permutato, quidam leguntur se etiam ab ipsa gentilitia labe præstitisse immunes."

Epilepsy has sometimes arisen from tænia. When this takes place the treatment will not be attended with much difficulty, as the disease may be removed either by means of rectified oil of turpentine, or by tin in powder given in large doses, and followed by cathartics. We have found in some individuals, that after worms, especially ascarides, have been expelled, so that there was no vestige of them for several weeks, they have reappeared within two months, as if a nidus had been left behind. In such patients, worms may be permanently destroyed by exhibiting proper anthelmintics before the expected period of recurrence, which may easily be ascertained.

Epilepsia hepatica.—When hepatalgia, biliary colic, icterus, or any other symptom of biliary congestion, precedes or follows an attack of epilepsy, local bleeding, an issue over the region of the liver, and mercurial purgatives will be requisite, and afterwards alternate courses of dilute nitro-muriatic acid and of taraxacum, the latter exhibited as follows:

℞ Extracti taraxaci, ℈ii.
Extracti gentianæ, gr. x.
Olei cinnam. min. ii. M. et divide in

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* When the bowels refuse to act regularly without the assistance of medicine, which is the case with many persons advancing in life, it is an error to order a purgative every day; the evacuation procured by medicine is generally so complete that a longer time elapses before the bowels fill than after a natural stool, therefore the purgatives resorted to, whether aloetic pill in the evening, or a saline aperient before breakfast, ought to be taken only on each alternate day. Their contents ought to be permitted sufficiently to accumulate before the bowels are again urged to discharge themselves of their load; by this means the cathartic being more completely incorporated with the fæcal residuum, irritation and mucous stools will be avoided. If a purgative be taken when the bowels are comparatively empty, more frequent discharges will be obtained, but they will be less consistent and satisfactory; and griping and tenesmus, and perhaps hemorrhoidal irritation, will be the consequence.

pilulas xii æquales. Sumat tres ter quotidie superbib. haustum decocti taraxaci.

R Taraxaci, ℥ii.
Extr. glycyrrhizæ, ʒii.
Aquæ ferventis quod satis sit ut colentur unciæ decem. Coque per horæ tertiam partem et cola. Colaturæ adde supertartratis potassæ, ℥iss. Divide in haustus sex.

Epilepsia nervosa.—The chief indication in this species of epilepsy, after the removal of the exciting cause, is to allay the irritability of the stomach and to strengthen the system. The stomach is ever disturbed, the disturbance evincing itself not in anorexia but in despondency, in irritability of mind, in the *animus, nec sponte, varius et mutabilis*, in depression of strength, unrefreshing sleep, and often in that most distressing sensation which has been called "the fidgets;" in palpitation, in acute pain in the mamma, and in the existence of various other symptoms of hysteria. In neither males nor females, is this variety of epilepsy connected with the state of the generative system, unless when the attacks proceed *ex onanismo*.

In nervous epilepsy our chief reliance is upon diet, regimen, attention to the state of the bowels, proper regulation of the mind; and on such medicines as valerian, camphor, snake-root, and castor. The following draught we have often known to relieve the irritable state of the nerves which attends this species of epilepsy.

R Radicis valerianæ,
Radicis serpentariæ, aa. ʒii.
Aquæ ferventis, ℥vii. digere per horam, et liquorem frigefactum cola. Colaturæ adde
Sp. ammoniæ aromatici, ʒii.
Tincturæ serpentariæ, ʒvi. M. et divide in haustus sex. Sumat unum meridie et vesperi.

Tonics are also applicable to this affection, as cinchona and iron, especially the former when epilepsy is periodic. We have known moderate doses of nitrate of silver given with advantage in aggravated hysteria, and hence, although we have not successfully prescribed it in nervous epilepsy, unless in one instance, there are many cases of this variety of the disease in which it would probably be of great use. Much may be expected from agreeable occupation, variety of scenery, the bracing air of the sea, and tepid and cold seabathing. All kinds of fermented liquor, tea, and also coffee, ought to be given up, together with the use of tobacco, if unhappily the patient should have addicted himself to the use of that poisonous and demoralizing weed.*

Epilepsia uterina.—If the attacks of epilepsy precede the menstrual period or accompany it, the effort of the constitution being imperfect, relief must be sought for in venesection, purgatives, and the antiphlogistic regimen. In the interval between the periods, those emmenagogues must be employed which moderately act upon the intestines, and at the same time give vigour to the circulation; as, for example, pills of myrrh, sulphate of iron, and aloes; or pretty full doses, two or three times in the day, of the carbonate of iron, with a moderate dose, every second night, of the decoctum aloes compositum. The tepid pediluvium, or hip-bath, with friction of the back and limbs at bed-time, more especially just before the menstrual period, may be practised; and in this species of epilepsy also the patient ought to have the benefit of sea-bathing, and frequent changes of residence.

There is a point from which our attention ought never to be withdrawn in the treatment of epilepsy, namely, the exciting cause of the first paroxysm. If the paroxysm have been caused by mental impressions, not only ought the causes of fear, anxiety, and displeasure, to be as much as possible removed, but endeavours ought to be used to strengthen the mind. If from excess of any kind, then every method of renovation must be employed. If from inanition, proper restoratives must statedly be exhibited. If the disease be periodic and connected with dysmenorrhœa, after evacuations, if they are indicated, anodynes, even in large doses, will be necessary; of which the following will be found one of the most efficacious:—

R Camphoræ, (ope sp. vini rect. in
pulv. red) ʒss.
Extracti hyoscyami, gr. xv.
Extracti opii, gr. iii. M. et divide in pil. xii æquales.

Of these compound camphor pills two may be taken on the very first accession of pain, two in an hour after, and even a third dose may be taken after a second hour; if relief is not obtained, sometimes a double or even quadruple portion of opium must be given; it being an established point of practice that the pain which attends dysmenorrhœa is to be subdued without loss of time. We apprehend that the efficacy of full doses of camphor on painful menstruation is not so generally known as is desirable.

To propose a regimen of diet which would apply to every variety of epilepsy, as we have already hinted, would lead to a disproportionate extension of this article. The directions, therefore, which we have given, are of necessity general, and may be departed from should the paroxysms return with unabated frequency. Eminent physicians, as for example Dr. Fothergill, have recommended abstinence from all kinds of animal food and fermented liquors. He tells us that, "In the form of epilepsy, which may be supposed to proceed from disorder of the digestive organs, evidenced in craving appetite, and supported by inattention to diet, laxatives, with a light chalybeate interposed and steadily continued, together with a course of diet consisting of milk, vegetables, fruits, and things prepared from them, and in moderate quantities, seldom fail of removing the disorder."

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* Tobacco is an enemy to domestic economy and personal cleanliness; it taints the breath permanently, injures the digestion, impairs the intellect, and it even shortens the life of some of its votaries. Cullen says it produces loss of memory before the usual period. Snuff keeps a great many of the females, engaged in lace-making, in this neighbourhood (Newport Pagnell), under the continued influence of hysteria, and gives them an early stamp of age; at thirty a snuff-taker looks as if she were forty years old. It is the sole cause of a variety of dyspepsia, of which we have witnessed a vast number of instances—the symptoms being a painful sensation of a lump at the stomach—of a hard undigested substance pressing, as it were, upon a tender part of the stomach, which sensation is, for the time, relieved by taking food; remarkable depression of spirits, every thing seen through a medium of gloom and distrust; and tremors of the nerves. "Upon an accidental interruption of snuff-taking for a few days, the pains do not occur, upon a return to snuff the pains return."—(*Cullen's Mat. Med.* vol. ii. p. 275.) Chewing tobacco will produce the same affection. Smoking produces anorexia and emaciation. The chief evil, however, in tobacco, taken in any way, is that it leads myriads upon myriads to the habitual use of ardent spirits and opium, and consequently to the ruin of soul, body, and estate.

In Heberden's Commentaries we have the following pithy illustration of the importance of diet: "Duo epileptici ab omni cibo animali abstinuerunt, et sanati sunt." And Dr. Abercrombie, no mean authority in this or in any practical point, is of opinion that the only remedies of real efficacy in such cases are purgatives, a strictly vegetable diet, and total abstinence from strong liquors. According to our experience it would not be easy to overrate the importance of diet in epilepsy, at the same time we admit that many changes may be necessary before the full advantage is obtained which diet is capable of yielding; one rule alone, in our opinion, being established, namely, that food ought ever to be taken in great moderation; in other words, that there is danger in a full meal, however unexceptionable the materials may be of which it consists.

When, in medical works of respectability, we meet with a variety of remedies, many of them possessed of dissimilar qualities, recommended for the cure of the same disease, we must conclude that its species are dissimilar in their nature, and require to be treated differently. In examining the anti-epileptic remedies recommended by authors, we may discover four classes, viz. evacuants, tonics, nervines, and emmenagogues: first, those which reduce vascular congestion or action, venæsectio, hirudines, fonticuli, setacea, cauterium, vesicatoria, irritantia, emetica, purgantia, antimonium, mercurius: secondly, those which invigorate the body and improve the digestion — aëris et dietæ mutatio, balneum frigidum, cinchona, amara, acida, zincum, argenti nitras, cuprum [artemisia vulgaris]: thirdly, medicines which relieve disorders of the nerves — serpentaria, cardamomum, valeriana, castoreum, moschus, camphora, guaiacum, hyoscyamus, belladonna, stramonium, opium: fourthly, emmenagogues — ammonia, galbanum, assafœtida, aloes, ferrum, oleum terebinthinæ, ruta. A consideration of the foregoing catalogue would justify the division of the subject which in this article has been adopted.

[Of late years, indigo given in very large doses, has been extolled by many practitioners. The writer witnessed numerous trials with it in the Philadelphia Hospital; but its efficacy was not marked. (See his *New Remedies*, 4th edit. p. 363, Philad. 1843.) Where epilepsy has been caused by an external injury of the head, the operation of trephining has been practised; and in some cases the results have been happy. The operation is, however, of a serious character, and ought not to be had recourse to, unless there is every prospect that the cause of the disease is seated in parts which can be removed by the trephine.]

If the necessity of more diligently studying epilepsy, of more carefully attending to its specific differences; if the inapplicability to some cases of epilepsy of the treatment which has succeeded in others, be admitted and acted upon, happier practical results will probably be the consequence. But, lest the reader should suppose that we are too sanguine in this our expectation, he shall have the concurrent testimony of the venerable commentator on Boerhaave produced, to whose authority he will more readily yield: "Illis observationibus sic collectis et in ordinem digestis, sedulo expendat medicus omnia, et facile deteget regulas agendorum et vitandorum, sed in singulari tantum hujus ægri casu. Nam generales in omnibus epilepticis curandis regulæ haberi nequeunt; quod enim uni prodest, sæpe nocet alteri. Ubi hoc factum, tota difficultas evanuit, nam reliquum est tantum facilis executio bene perpensarum rerum. Certum est, medicos, luculenta praxi obrutos, sæpe deficere in cura hujus morbi, cum tempus ipsis non sufficiat, ut singulari ægro tantam curam impendant; verum et doluerunt toties, ægrorum custodes observasse illa, quæ ipsi neglexerant, non sine famæ damno. Credo firmissime, si omnem animi attentionem adhiberent his medici, quod sanarent plures epilepticos, et levamen adferent fere omnibus."—Sect. 1080.

J. Cheyne.

EPISTAXIS, (derived from ἐπὶ and στάξις, *stillatio*, from στάζω, *stilo*,) a flow of blood from the nose. This is one of the subdivisions of the natural class of disorders termed hemorrhages, to which article in this work (in order to avoid unnecessary repetition) we refer for a general explanation of the circumstances under which it takes place.

Bleeding from the nose is a physical phenomenon too common and conspicuous to have escaped notice at any period; and from the earliest times its consequences, together with the conditions of the body which have accompanied and preceded it, have been objects of medical observation. The word epistaxis has, also, from a very early period, been applied to this affection under whatever circumstances existing; but it is evident that Hippocrates, who has left us several observations on the subject, used its original always to signify an *oozing*, and αἱμοῤῥαγία, *a rush of blood*: we make, however, no such distinctions.

Of the various hemorrhages, epistaxis is the most common; and so often is it attended with salutary effects, that its encouragement and suppression equally require the consideration of the medical practitioner. Its frequency is readily accounted for when we reflect on the structure of the Schneiderian membrane; its extreme tenuity, and the number as well as proportionate size of the ramifications of blood-vessels which traverse it in every direction, forming a complete net-work; with a comparatively smaller portion of interstitial cellular substance and thinner laminæ of membrane enveloping it than is to be found in any other part of the body. The blood-vessels of this membrane being for the most part supplied by the internal maxillary artery, and inosculating with some of the extreme ramifications of the internal carotid, any increased impetus given to the latter, or to the trunk of the former, is less resisted in this part; and, in consequence of the rupture which is very frequently occasioned, an escape of blood is effected, with relief of both these systems of vessels, and, in a very essential manner, to the advantage of the brain.

As in hemorrhages from every other part, it is important to observe that in epistaxis there are two opposite conditions of the blood-vessels, induced by corresponding states of the body under which it occurs: in the one the extreme vessels are ruptured by the increased activity of the circulatory system, general and local; in the other, from debility and relaxation their elasticity is destroyed, and, incapable of distension as well as of propelling their contents, their parietes readily give way; or, from the same condition, red blood insinuates itself through the exhalents, instead of the thinner and colourless part of this fluid proper to them. We shall proceed to consider epistaxis under these two conditions, adopting the common language of pathologists in applying to the former the term active or entonic, and to the latter passive or atonic epistaxis. [Like other hemorrhages, epistaxis may arise from mechanical hyperæmia—in other words, from some physical obstacle to the return of the blood from the mucous membrane to the heart.]

Entonic epistaxis occurs occasionally in very young children, most frequently before or about the age of puberty, and in persons of a plethoric or sanguine temperament; the latter are not unfrequently the objects of it until the advances of age effect a change on the constitution, and the balance of power is transferred from the arterial to the venous system. Thus we find in early life that this hemorrhage is almost always from the arteries, and in old persons, when it does occur, that the blood flows from the venous system. The habits and exercises of males render them more liable to epistaxis than females; but on the other hand we find in the latter that it is very often vicarious with the suppression of the menstrual discharge, and occasionally occurs with the same periodical exactness. Even in the male sex the influence of habit is often evinced in the occurrence of epistaxis, and, after other causes have been removed, it is sometimes with difficulty that its power is resisted.

Local injury, inordinate exercise, exposure to heat, or increased temperature of the atmosphere; hot drinks, stimulating diet, suppressed discharges, either natural or artificial; and all other circumstances which increase the quantity of blood, or the impetus by which it is distributed to the different parts of the head, may occasion the occurrence of epistaxis.

In addition to these causes, it has been frequently preceded by various emotions of mind, terror, anger, and even a single excitement of the imagination; hence, says Mason Good, we may readily trace by what means the philosophers and poets of the eastern world, and even some of those of the western, were led to regard the nose as the seat of mental irritation, the peculiar organ of heat, wrath, and anger; and discover how the same term אף (*ap* or *aph*) came to be employed among the Hebrews to signify both the organ and its effect, the nose, and the passion of anger to which it was supposed to give rise.

In some individuals it is probable that there is an extraordinary delicacy of the Schneiderian membrane and its vessels, which renders the latter peculiarly easy of laceration: there appears also to be a degree of correspondence between this expansion and the integuments of the face with which it is continuous, the phenomenon of blushing being often remarkable in persons subject to epistaxis, a circumstance which is doubtless also in great part to be referred to the identity of temperament predisposing to both of these affections.

Excitation of the olfactory nerves, in persons of peculiar irritability of the organ of smell, has occasionally induced epistaxis; an example of this kind has been recorded by Bruyerin, in which it was induced by smelling an apple: and another by Rhodius, in which the odour of a rose appeared to be the exciting cause. Coughing, sneezing, singing, and reading aloud for any length of time, stooping also, and particular postures of the body, have not unfrequently occasioned it. The secretory office of the Schneiderian membrane is liable to material interruptions from the vicissitudes of temperature to which it is necessarily exposed in the act of respiration; and any check by cold to its natural or inordinate secretion will occasionally lead to the rupture of blood-vessels in this part.

The febrile disorders which are attended with determination of blood to the head are often the precursors of epistaxis; and this affection, from the days of Hippocrates, who pronounced it critical, an expression which has been adopted through succeeding ages to the present day, has been welcomed as a salutary effort of nature, either to relieve or bring the disorder to a favourable issue. Some nice distinctions have been drawn, by the great authority just mentioned, of the different indications from the occurrence of epistaxis on different days of the progress of fever; but independently of their being inapplicable to the fevers of this country, more extended experience has shown that this is to be regarded as only one of an assemblage of symptoms from which our judgment of the issue of such diseases can reasonably be drawn.

Epistaxis has sometimes been observed to be synchronous with the periodical returns of intermittents, taking place at the accession of the hot stage, when in this, as in other disorders in which fulness of blood in the vessels of the brain has been one of the morbid conditions, the greatest danger of injury to that organ, and its consequences, has been averted by the escape of blood from the nose.

In congestions of blood in other organs of the body, whether of an acute or chronic character, as in the lungs, but particularly in the liver; or in mechanical obstructions to the free course of blood, occasioning its determination to the head, or an impediment to its free circulation in this organ, the same effect has been attended with the same salutary consequences. The suppression of the natural secretions of the body is a frequent cause of epistaxis. We see it occurring very commonly in amenorrhœa; in those diseases in which the secretions of the other mucous or serous membranes are suspended; and not unfrequently when the natural function of the skin has been checked partially or generally. Morgagni has handed down to us the record of an extraordinary, and, as far as we know, a singular instance of the simultaneous occurrence of epistaxis in a number of persons:—it is stated that in the year 1200 there was a great mortality of men in the space of twenty-four hours, in Tuscany and Romandiola, by a flux of blood from the nostrils; and Morgagni has remarked that Clementini, the historian of Rimini, had noted that in the same year a great number of deaths from hemorrhage had occurred within four-and-twenty hours at Rimini, Ravenna, and in other cities of the Roman province; but from what part of the body is not mentioned. Various conditions of the atmosphere, it is well known, have a powerful effect on the expansive quality of the blood, as well as of other fluids: besides the effect of the stimulus of heat, the *plethora ad molem* is induced by the same cause; it not unfrequently happens that passing from a cold into a heated room occasions this kind of hemorrhage; and a sudden transition in the natural atmosphere occasioned, it is probable, the endemic we have just noticed. The same expansive quality of the blood is evinced by alterations of the atmospheric pressure; and in the ascent of high mountains an early physical consequence has been a flow of blood from the nose, increasing in proportion to the altitude, and succeeded by hemorrhage from the ears and lungs, as well as by other very alarming symptoms. We have an interesting example of this in the enterprising traveller Saussure, on the occasion of his celebrated ascent of Mont Blanc.

The passive or atonic epistaxis takes place only in those extreme states of depression of the vital powers, which occasionally occur after the inflammatory stages of fever have passed by, or in such as have been considered of a putrescent tendency, as in the advanced state of eruptive fevers, particularly of malignant small-pox and scarlatina. In cachectic diseases, such as the purpura hemorrhagica, scorbutus, and certain broken-down states of the constitution, consequent to visceral disease of a chronic kind, particularly that of the liver, arising from the long-continued influence of a hot climate, or the habitual intemperate use of spirituous liquors, the atonic epistaxis is occasionally a very troublesome and dangerous symptom.

Instances have been recorded of the loss of almost incredible quantities of blood from the vessels of the nose. Ten, twelve, and upwards of twenty pounds have been known to flow away before the hemorrhage has ceased. "Bartholin mentions a case of forty-eight pounds, Rhodius another of eighteen pounds lost within thirty-six hours; and a respectable writer in the Leipsic *Acta Erudita*, a third, of not less than seventy-five pounds within ten days, which is most probably nearly three times as much as the patient possessed in his entire body at the time the hemorrhage commenced." In the Ephem. Nat. Curios. is a case "in which the quantity indeed is not given, probably from the difficulty of taking an account of it, but which continued without cessation for six weeks." (Good's Study of Medicine.)

The active or entonic epistaxis is usually preceded by a sense of weight and fulness in the forehead and face, frequent flushing in the latter, with heat and itching in the nose; a remarkable degree of throbbing is often experienced in the temporal arteries, a ringing in the ears, and sometimes a dull or indistinct sense of hearing; but in many instances no precursory symptom is observed, and the blood issues forth suddenly, with various degrees of force.

Passive or atonic epistaxis occurs, in general, without any preceding indication peculiar to it; and in many instances, particularly in the adynamic states consequent on fevers, it is not unfrequently accompanied with entire insensibility. In the cachectic states of the constitution giving rise to this kind of epistaxis, inordinate and uncontrollable losses of blood from the nose have most commonly taken place, and therefore have been more frequently the objects of attention in advanced than in early life.

Entonic epistaxis is always to be regarded as an indication of the urgent necessity for the system of the blood-vessels of the head to be relieved of a superabundance of this fluid; and so long as this condition lasts, it ought to be encouraged, or at least on no account restrained by direct suppression. It is often observed that the evacuation of a small quantity of blood from the vessels of this organ is the spontaneous cure of a severe headach, or relieves an oppressed state of the brain, dependent on preternatural fulness of its blood-vessels; and it is probable that apoplexies and other dangerous diseases of this organ have not unfrequently been stayed, if not entirely prevented, by this natural method of cure. In advanced life, however advantageous this hemorrhage proves under an immediate threat of such forms of disease, we must bear in mind that it is an indication of an altered condition of the blood-vessels of the head, which pathologists have observed progressively to increase in the majority of persons after the middle period of life, and that it is often, on this account probably, the precursor of fatal apoplexies, epilepsies, palsies, and other cerebral diseases.

In a practical view we may consider epistaxis, in reference to the condition of the various organs of the body, and the positive disease (if any) with which it is accompanied, in the same light as artificial bloodletting, always remembering the importance and delicacy of the organ to which a determination is already established, or probably would be, if the exit of blood from the ramifications of the vessels supplying the nose were prevented: such diseases and conditions will require their peculiar kinds of treatment, and the avoidance of the exciting causes which produce this particular affection. It occasionally happens, however, that this evacuation is excessive at a single occurrence; or that by its continuance a passive state of the vessels is induced; or sometimes, independently of plethora, the evacuation becomes, by frequent recurrence, habitual, and, if not arrested, would be productive of consequences dangerous to life.

The particular treatment necessary to prevent an excessive or habitual epistaxis of the entonic kind is founded on two principles; 1st, diverting the determination of blood from the vessels of the head to other parts of the body; and, 2dly, the direct application of those means which are calculated to act on the extremities of the vessels themselves; which means consist of astringent substances and mechanical compression.

The former includes the various remedies which are comprehended in the antiphlogistic regimen, those being selected which are adapted to restore the particular function which may in each case have been suspended, and to produce a counter balancing excitation in a system of vessels at a distance from the already overloaded vessels of the nares and head: hence the use of purgatives is particularly indicated; and in very plethoric habits a combination of such as stimulate the tract of the alvine canal, as well as excite its watery secretions, will be found advantageous.

Bleeding, also, from a vein in the arm or foot, or topical bleeding by leeches applied to the head, or by cupping on the nape of the neck, will be requisite in some cases in which the hemorrhage from the vessels of the nose may have been so small as to point out only the necessity of such an evacuation, but not sufficient to remove the occasion of it, and the symptoms with which it is accompanied. In habitual epistaxis, also, we shall find the necessity often of thus artificially changing the distribution of blood, and, by anticipating the periods of the return of this morbid disposition by proportionate bleeding, may at length be enabled altogether to prevent it.

Emetics have been occasionally of service, and are recommended by Stoll, on the principle of relaxing the capillaries; but unless epistaxis should appear to depend on an inordinate fulness of the stomach, impeding the due course of the blood in the large vessels, we should be wary in having recourse to them, for the very action they induce is an impediment to the free circulation of blood in the vessels which it is our object to relieve, and has occasionally been the cause of the affection which is to be removed. Sprinkling cold water on the face will often have a powerful effect in the suppression of this kind of hemorrhage, and even immersion of the whole head has been successful when other remedies have failed. A striking instance illustrative of this is recorded by Dr. Darwin, in his Zoonomia; the patient was a lady who had epistaxis for several days from a part of the nose to which the attempt to apply mechanical compression had failed, and in whom, from a preternatural sensibility of the pharynx, it was found impossible to stop up the posterior nares: venesection and the other usual remedies had been tried in vain: but by immersion of the head in a pail of water, rendered colder by the liquefaction of some common salt, the hemorrhage was checked, and did not return; but hardness of the pulse continuing, loss of blood from the arm on the following day was resorted to as a requisite precautionary measure.

Dashing cold water on the genitals has sometimes had an instantaneous effect in the suppression of epistaxis. In the same manner, the popular remedy of applying a large key or other piece of cold metal between the clothes and the surface of the back has caused it to cease. The exposure of the face to cold air, the observance of an erect position, with an inclination of the head backwards, cold drinks, and the application of cold water or ice to the nose, will often be sufficient to terminate this hemorrhage.

If these means, however, should fail, the nostril from which the blood issues should be stopped with a piece of lint or other soft substance, so that the retarded blood may coagulate, and thus produce pressure against the ruptured vessel: if this should not succeed, recourse must be had to astringents in preference to methods of compression to be presently described, and which, though perhaps more certain, are extremely disagreeable in their application, and need be resorted to only under urgent circumstances. Astringent applications may be used in the form of an injection with a syringe; or that of powder, carefully blown into the nostril through a quill: the method of inhaling them by an inspiratory action, as commonly advised, is apt to disturb any portion of coagulum that may be already formed, or to increase the excitation of the ruptured vessel itself. A variety of astringent applications have been recommended for the suppression of epistaxis; those most in use are vinegar and water, dilute mixtures of sulphuric acid with water or spirits of wine, spirits of wine alone, tincture of benzoin, solutions of alum, of the metallic salts, &c.; the two last mentioned are chiefly to be relied on, and should always be preferred. Two drachms of alum, or from two scruples to a drachm of sulphate of zinc, dissolved in half a pint of distilled water, or the solution of the acetate of zinc of the Edinburgh Pharmacopœia, or a drachm and a half of the muriated tincture of iron, diluted with six ounces of water, will be suitable injections for this purpose: the common solution, also, of the acetate of lead, or the same salt in a much less diluted state, may also be used for the same purpose, after which a piece of lint, imbued with whichever of the solutions may have been preferred, should be passed up the nostril with a probe, or some such instrument, so that firm compression may be effected.

The powders to be used in the manner we have already stated, ought to be finely levigated; but even in this state the irritation they are apt to excite may be productive of consequences which would more than counterbalance the advantages to be expected from their astringent quality. The sulphate of alum and powder of galls have been usually preferred; a powerful styptic has also been found in charcoal, either used in the form of powder, or mixed with water and applied as a paste on a tent of lint. An instance of the successful use of the powder of gum acacia blown into the nostril in a case of epistaxis, which had continued for two days, and had resisted the other means generally adopted, has been transcribed from Hufeland's Journal into the 27th volume of the Medical Repository. As this substance is not only free from the objection we have mentioned to astringent powders, but congenial to the sensibility of the Schneiderian membrane, and probably produces its good effect simply by increasing the tenacity and adhesive quality of the blood on its issue from the extremity of the bleeding vessel, it appears to us that in some cases it may be an eligible application.

Should the practitioner be baffled in his attempts with the means above suggested, or should the unsuccessful use of one astringent give little promise of advantage from another, direct compression may be made by passing a long piece of catgut from the anterior aperture of the nostril which is the source of the hemorrhage, so far into the pharynx, that by a pair of forceps it may be drawn into the mouth, in order that a piece of cotton or lint may be attached to it, of sufficient thickness to press against the parietes of the canal when the catgut is again retracted: this being done, it is to be separated from the lint or cotton, which is allowed to remain in the canal until further means shall have had the effect of suppressing the hemorrhagic tendency. Such is the method generally recommended by surgical writers, but the irritation excited on putting it into practice, and, when effected, the aversion expressed by patients to its endurance, are so great, that, whatever the danger may be, they will rarely submit to or suffer its continuance for a sufficient length of time; and it must be acknowledged that there is some hazard that its removal may prove a fresh cause of excitement. A great surgical authority (Mr. Abernethy), with his accustomed humour, has told us that he knew that such a method could be adopted, for he had seen it done; but that whenever he had tried to do it he always failed, finding an obstacle in the excessive irritation produced in the muscles of the pharynx: but the same authority has observed that he had never seen an instance of epistaxis which could not be suppressed, (and that he had seen a great many instances,) by the introduction of a cylindrical plug of lint through the anterior nares, made sufficiently large to fill the tubular part of the nostril, being first wetted and wound round a probe, so as to give it the form of a bougie, long enough to allow it to be passed along the floor of the nose from the anterior to the posterior aperture, but not into the throat; the probe being withdrawn when the lint has been thus disposed of. This plug should be allowed to remain in three or four days, while the proper means are taken to remove the causes of the occurrence of the hemorrhage.

The after treatment, which is usually of more importance than the immediate suppression of nasal hemorrhage, for the latter will frequently cease as soon as it is desirable that it should do so, consists in the pursuance of the antiphlogistic regimen to a degree commensurate with the urgency of the general symptoms and state of the body. It is necessary to consider how far it may be safe to regard the recurrence of an attack as the salutary consequence of the impeded function of a particular organ, or other co-existent disease; and how far, also, it may be reasonable to anticipate the practicability of the restoration of the one or the cure of the other, on which the hemorrhage may depend, without the hazard of a further loss of blood, if it should happen, exceeding the necessity of the system, or being otherwise disadvantageous to the circumstances of the patient.

We deem it superfluous to enter into a detail of the antiphlogistic means to be adopted; the general condition of the system affording the best indication of the extent of reduction which may be necessary. It will be evident that the causes which excite the attacks in the first instance must be avoided as those likely to promote their recurrence. The observations already made as to artificial bloodletting, purgatives, and emetics, will also be applicable to the state we are now considering. It may nevertheless be necessary to diminish the action of the heart and arteries further than it would be prudent to attempt by greater abstraction of blood, as well as to oppose the reactive tendency which may exist when this remedy has been adopted. In digitalis, or nauseating doses of tartrate of antimony, the suitable means will be found: one or both of these may be combined with the common diaphoretic saline draught and nitre, or other excitants of the skin and kidneys.

When this hemorrhage, either from long continuance or habit, has induced an atonic state of the blood-vessels, and a disposition to its inordinate or frequent recurrence is manifested, the internal use of diluted sulphuric acid, or superacetate of lead, may be advantageously had recourse to; and whether the hemorrhage be combined with an entonic or atonic condition of the body, if it have been excessive, or there should be reason to apprehend that it may prove so, experience has shown that either of these astringents will be a powerful adjuvant whether to the antiphlogistic or tonic plan of treatment, whichever may be directed to establish the contractility required in the ruptured end of the bleeding vessel from which the effusion may have taken place. This consideration leads us to notice a remedy,—the ergot of rye, which, from its powerful effect of exciting the natural action of the uterus, has been applied to a corresponding condition of the blood-vessels of that organ productive of hemorrhage, and, as it appears, with the desired effect: on the same principle it has lately been used in epistaxis; (Med. Chir. Rev. July 1831,) and as it was followed by its cessation, further experience may determine it to be a valuble remedy in this as well as in other kinds of hemorrhage in which the bleeding vessels are reduced to an atonic state. Our present experience of it, however, in cases of epistaxis is too limited to enable us to decide on its eligibility.

In passive or atonic hemorrhage it is scarcely necessary to observe that those means which constitute the antiphlogistic regimen are inadmissible. The general treatment must be adapted to the disease, whatever it may be, which exists with this affection; and on some occasions, when the hemorrhage is excessive and exhausting, powerful stimuli will be required; a large dose of laudanum, with carbonate of ammonia and camphor mixture, may be given with advantage under such circumstances; brandy and water, brandy-gruel, wine, strong animal soups, and jellies will also be necessary to recruit the exhausted strength of a patient, weakened as he must be by the continued or repeated drain of this vital fluid, under circumstances of disease in which debility is a fearful, and in many instances an irremediable condition.

The local treatment consists of the application of astringents and the use of compression or stoppage by the insertion of lint or cotton, as advised in the local treatment of entonic hemorrhage; and must be immediately adopted, unless in some peculiar states of the blood-vessels of the brain, in which it is possible that the balance of advantages may preponderate in favour of a slight evacuation of blood from the vessels of the nose, even though they should be in a passive or atonic state; but as this occurs in the advanced stages of continued and eruptive fevers, or purpura hemorrhagica, or of scorbutus, accompanied with every other symptom of exhaustion, the oozing of blood should be restrained as soon as possible. It too often happens, however, under such circumstances, that the work of death is already begun, and that the arrest of the hemorrhage by mechanical and not vital power proves but a feeble obstacle to its completion.

[Of late, a mechanical agency has been proposed for arresting the flow of blood, which, it is affirmed, is a popular remedy for epistaxis in the United States. (*Amer. Journ. of the Medical Sciences*, Jan. and April, 1843.) It has been strongly urged on the attention of the profession by M. Négrier, and has been made by him the subject of different communications to the Académie des Sciences, of Paris. The patient is made to stand up with the head elevated. The nostril whence the blood flows is compressed with the finger, and the corresponding arm is directed to be raised perpendicularly, and to be kept in that position for about two minutes. The hemorrhage is soon arrested, owing, M. Négrier thinks, to a less vigorous circulation through the carotids, resulting from the increased force required to carry on the circulation through the upper extremities when raised. Cases have been published by others than M. Négrier in which this plan has been successful. M. Négrier has found it equally serviceable in encephalic hyperæmia, and in cephalalgia with somnolency,—whenever, in other words, it has been desirable to diminish the flow of blood to the head. (*Revue Médicale*, Juin 1843; or *Amer. Journ. of the Med. Sciences*, April 1844, p. 446.)]

W. Kerr.

[EQUINIA. (See Glanders.)]

ERETHISMUS MERCURIALIS, mercurial erethism. The word erethismus (from *ἐρεθίζω*, to excite or irritate,) is obviously a generic term which may be applied to any kind of morbid sensibility or irritability; but it has hitherto been almost exclusively confined to that species of erethism which sometimes arises from the use of mercury, and to which the appropriate name of *erethismus mercurialis* was given by the late scientific John Pearson, to whom we are indebted for the first notice of the disease. Prior to the period at which that distinguished surgeon was elected to the charge of the Lock Hospital, a year seldom elapsed without the occurrence of two or three sudden deaths, without any assignable cause, among the patients who were undergoing a mercurial course. These were, in truth, cases of mercurial erethism, the nature of which was not then understood. Mr. Pearson has well described the disease as characterized "by great depression of strength; a sense of anxiety about the præcordia; irregular action of the heart; frequent sighing; trembling, partial or universal; a small, quick, and sometimes intermitting pulse; occasional vomiting; a pale, contracted countenance; a sense of coldness: but the tongue, (Mr. Pearson adds,) is seldom furred, nor are the vital or natural functions much disordered." This affection appears to arise from mercury acting as a poison. So great is the danger attending this affection in its severer form, that any sudden or violent exertion may prove immediately fatal. Happily, however, its first appearance may be readily detected, and, by prompt measures, effectually removed. A tremulous motion of the tongue, a slight trembling in the limbs, or a sense of fluttering within the chest, are among the earliest indications of its approach. The pulse becomes feeble, hurried, and irregular, sometimes intermitting for several seconds, and then beating with great rapidity. On applying the hand to the left side of the chest, the heart will be found to act with extreme irregularity.

This peculiar irritation may arise from the administration of mercury in any form; and may occur during any period of a mercurial course, though most commonly at its commencement. The exact circumstances which favour its occurrence in the particular individuals attacked have not hitherto been ascertained. The writer of this article, while resident medical officer of the Lock Hospital, has seen it produced by the inunction of a single drachm of mercurial ointment, and reproduced, in the same individual, after the discontinuance of the medicine for a whole month, by three frictions, each consisting of only one drachm of the ointment. It is remarkable, however, that in the greater number of instances, a full and adequate course of mercury has been afterwards borne, without any recurrence of erethismus, by the very persons who had suffered from it during the commencement of the course.

The *treatment* of the mercurial erethismus is as simple as it is effectual. *The open air is the grand antidote.* As soon as the slightest intimation of the disease is perceived, the patient should be carried into the open air, with as little exertion to himself as possible, and there he should remain as long as may be practicable. To use Mr. Pearson's words, "he should *live* there." Mercury, in every form, must be immediately discontinued, and a mercurial atmosphere carefully shunned. If inunction have been used, the skin should be thoroughly cleansed from any adhering ointment. The subcarbonate of ammonia, either with or without camphor, is an important auxiliary, and may be given in rather full doses, at moderate intervals, until the circulation becomes more steady, and the general power of the system revives. It is an important and encouraging fact, that from the time at which this treatment was adopted by Mr. Pearson, not a single death occurred from erethismus at the Lock Hospital.

After an attack of mercurial erethism, great circumspection will be needful both as to the time of recommencing, and the mode of conducting, the mercurial course. In the slighter cases, the disease entirely subsides in five or six days, and even in the severer forms the mercurial treatment may often be safely resumed within a fortnight. Still the most watchful care must attend every remaining step of the course.

The reader may consult with advantage Pearson's Principles of Surgery, and the observations, by the same author, of the different articles on the Materia Medica which have been employed in the cure of Lues Venerea.

T. H. Burder,

ERYSIPELAS. This term is derived, according to some authors, from *ἐρύω, to draw*, and *πέλας*, *adjoining*; implying that a disease has a tendency to spread to the adjoining portions of the skin. Various other derivations have been suggested, but that now adopted appears to be the more correct. It was termed by the Greeks *ἐρυσίπελας*, by the Romans *Ignis Sacer*, and is known in popular language by the name of *the Rose*, from the colour of the skin, and by that of *St. Anthony's fire*, from the burning heat with which it is accompanied.

Erysipelas may be defined inflammation of the skin, either alone, or combined with that of the subjacent cellular tissue; generally, though not always, accompanied with vesicular eruption, the local affection being attended by symptomatic fever.

The confusion and contradiction which have existed among practical writers respecting the nature of erysipelas, have in some measure arisen from attempts to found a correct classification of its varieties on some unimportant circumstances in its progress. For example, Cullen places erythema and erysipelas, which are certainly only modifications of the same disease, under different orders. He classed the former among the Phlegmasiæ, the latter among the Exanthemata or rashes. It is evident, however, that he was aware of their identity, as he laid down their diagnosis with great accuracy in the following passage. "When the disease is an affection of the skin alone, and very little of the whole system, or when the affection of the system is only symptomatical of the external inflammation, I shall give the disease the name of erythema; but when the external inflammation is an exanthema, and symptomatical of an affection of the whole system, I shall then name the disease erysipelas." (First Lines of the Practice of Physic, sec. 274.) If Cullen intended to apply the characters of his order Exanthemata to erysipelas, it must be observed that it does not correspond in its most important features with this order.

Willan (On Cutaneous Diseases, Order iii. Genus 6, and Order iv. Genus 1,) and Bateman (Practical Synopsis, pp. 117 and 124,) classified erythema and erysipelas according to their occasional external characters. Thus erythema is placed among the Exanthemata, and erysipelas among the Bullæ. This classification would be less exceptionable were vesication an invariable accompaniment of the cutaneous inflammation; but when we consider the occasional absence of this symptom in erysipelas, it is clear that any nosological arrangement founded on an appearance which is not invariably observed, can only lead to confusion and misapprehension.

J. P. Frank (De Curandis Hominum Morbis, Lib. iii,) has adopted Cullen's classification as to erysipelas, but includes erythema among the Impetigines, while Rayer, (Traité des Maladies de la Peau,) after grouping together erythema and erysipelas, places them among the Exanthemata. Mr. Lawrence (Med. Chir. Trans. vol. 14,) considers erysipelas to be inflammation of the skin, but that like other inflammations it varies in degree. When it affects the surface of the skin, which is red, not sensibly swollen, and without vesication, it constitutes erythema. When the inflammation is more violent, so as to produce swelling of the skin, or in still more severe cases, when the cellular and adipose membrane, as well as the skin, become inflamed, he designates the disease erysipelas.

Varieties of erysipelas.—The various forms of erysipelas depend on the degree of the local inflammation, the type of the accompanying fever, and on particular circumstances with which the case may be complicated. A full account of the varieties of this disease will be found in the article ERYTHEMA.

Various divisions of erysipelas have been proposed. Some writers, as Burserius, have founded distinctions on its supposed causes. This author divides it into three species; 1. *primary* or *idiopathic;* that is, arising spontaneously from an internal cause, not preceded by any other disease; 2. *symptomatic* or *secondary,* supervening on another disease, by which its progress is influenced; 3. *accidental,* when it is excited by some obvious external cause.

Others, again, have divided the disease into *idiopathic,* (from an internal cause,) and *traumatic* (from an external wound.) Later writers have introduced subdivisions from differences in the degree of local inflammation. This seems to have been the ground of Willan's and Bateman's classification: viz. 1. *phlegmonous;* 2. *œdematous;* 3. *gangrenous;* to which they add, 4. *erratic,* (migratory.)

Another distinction has been made, according as the disease appears on different regions of the body, viz., *erysipelas of the face and head, of the trunk,* and *of the extremities.*

We shall describe three forms or varieties: 1. *simple erysipelas;* 2. *phlegmonous erysipelas;* 3. *œdematous erysipelas;* and afterwards point out some differences depending on its situation on the several regions of the body.

1. *Simple erysipelas.*—In this, which is the mildest form of the disease, the inflammation is confined to the skin, which is hot, smooth, red, and shining; the colour varying from a bright scarlet to the more deep rosy or livid tint.

The swelling is either so inconsiderable as to be scarcely perceptible, or, when the inflammation is in a greater degree, an evident tumefaction is felt on passing the finger over the inflamed surface. When the inflammatory action is still more considerable, effusion takes place into the subjacent cellular tissue; and when this happens, the swelling is proportionably increased. The accompanying pain, which varies according to the intensity of the local disorder, is of a pungent burning kind, very different from the throbbing or pulsatile pain of phlegmon. About the third or fourth day after the appearance of the disease, vesications form on different parts of the inflamed skin, after which there is a sensible diminution of the local suffering. The vesicles are sometimes small and numerous; occasionally they are of a larger size, and in a day or two either break and discharge their contents, or the fluid dries into hard yellow crusts, which fall off, leaving the subjacent skin sound, or sometimes abraded. In very mild cases the local symptoms disappear without vesication or even desquamation of the cuticle; more generally, however, when the inflammation ceases, the cuticle becomes detached, and falls off in successive portions. Although in by far the greater number of cases the disease is thus terminated, in some instances its disappearance from one part of the skin, more particularly if sudden, is followed by its appearance on some other part. When erysipelas shows this tendency to metastasis or translation, it constitutes the *erratic* form described by Willan and other authors. In such instances it is important to watch the condition of the internal organs, more particularly if the recession of the erysipelatous inflammation be followed by symptoms which indicate visceral disease.

Swediaur (Nov. Nos. Meth. Syst. vol. ii.) gives the case of a robust plethoric man, 55 years of age, who had for many years laboured under paroxysms of gout, which returned at stated periods. He had been free from his gouty attack for a longer period of time than usual. The eyelids became suddenly swollen; two days after, the œdema disappeared from the palpebræ; he then complained of pain in the throat and difficulty in swallowing. This was soon removed by the use of gargles, when the œdema of the eyelids returned; in a few days afterwards the fingers of the right hand became in succession red and swollen, and subsequently ulcerated. The man then recovered. After the lapse of some months the disease returned, and assuming the same migratory course, fixed in the feet, where it produced ulceration, on the healing of which the patient's health was completely restored.

Frank (De cur. Hom. Morbis, vol. ii.) relates the history of a woman in whom erysipelas migrated from the face to the feet, thence to the hip, and afterwards re-appeared on the face. After it disappeared from the face, the intestines became affected; soon afterwards she was seized with disease successively in the chest and in the brain.

Willan gives the only case of erratic erysipelas which had in his experience proved fatal. A labouring man, aged 44, after much fatigue and exposure to cold, became affected with cough, shortness of breath, and febrile symptoms. Five days afterwards an erysipelatous patch appeared on his left shoulder, and another on the left leg. On the seventh day, similar patches appeared above and below the knees. On the eighth day the eyelids became tumid and red. About this time the other swellings assumed a livid hue, the febrile symptoms increased, and were attended with deafness and coma. On the ninth day the tumour of the right eye extended to the temple, upon which small phlyctenæ soon after formed. On the eleventh and twelfth the patient seemed totally insensible; his pulse became feeble and irregular, and he died on the following day. (Willan on Cutaneous Diseases.)

2. *Phlegmonous erysipelas.*—In this form the inflammation affects the skin and the subjacent cellular and adipose tissues, and generally terminates in suppuration, and even sloughing of the affected parts. It generally occurs in young plethoric persons; those in more advanced life, however, are not unfrequently the subjects of it, though its progress is more rapid, and its duration shorter, in young than in elderly people.

Phlegmonous erysipelas appears more frequently on the extremities than on any other part of the body. The fever with which it is accompanied is of the inflammatory character; and occasionally symptoms of gastric disturbance arise, either at the beginning or during its progress. The redness of the skin is of a deep tint, and, as in other forms of erysipelas, disappears on pressure. The pain is severe, and accompanied with a sensation of burning heat, while, in consequence of the effusion which takes place into the subcutaneous cellular membrane, the affected parts communicate a peculiar feeling which has been expressed by the term *brawny.*

When the disease has gone on for four or five days, vesications appear, and go through the same changes as in simple erysipelas; or sometimes, instead of this process, desquamation of the cuticle takes place. The redness then declines, the skin assumes a yellow tinge, the swelling and febrile symptoms gradually subside, and the disease may thus end in resolution. This favourable termination is by no means common. Phlegmonous erysipelas more commonly ends in suppuration, and even in gangrene, the purulent matter in the former case being either confined in small abscesses, or diffused in the cellular membrane.

When gangrene takes place, the cellular membrane becomes completely disorganized, and, according to the description of Mr. Lawrence, appears like a dirty spongy substance filled with turbid fluid; then losing its vitality altogether, it is converted into more or less considerable fibrous shreds of various size and figure, which come away, soaked with matter like a sponge; while the integuments, being deprived of their vascular supply, become livid, and often lose their vitality. When these changes take place, the tension of the previous inflammatory stage is succeeded by a peculiar softness; the sensation thus imparted has been compared to that excited by a quagmire or morass, and hence the term *boggy* has been given to it.

When an entire limb is affected with phlegmonous erysipelas, the inflammation and subsequent disorganization of the cellular tissue is not confined to that portion which is immediately under the skin, but extends to the intermuscular stratum. Should the patient survive such an attack, the skin, fascia, muscles, tendons, and bones, as stated by Mr. Lawrence, are so agglutinated and fixed, after the extensive destruction of the connecting cellular tissue, that the motions of the part are permanently and seriously impaired.

Various morbid appearances in the internal organs have been discovered in fatal cases of phlegmonous erysipelas. These organic inflammations, which were evidently the more immediate cause of death, have been often unaccompanied by symptoms by which their existence during life could be ascertained.

3. *Œdematous erysipelas.*—This species, which may be said to be intermediate between the simple and phlegmonous, is observed chiefly in persons of impaired constitution, or in those who have a tendency to dropsical effusion. The skin, which is of a pale red colour, inclining to a yellowish brown, is smooth and shining, but less hot and painful than in the other forms. The inflammation is of the sub-acute kind, and gives rise to serous effusion; the swelling extends slowly and gradually, leaving the impression of the finger as in anasarca, from which circumstance this form has received its distinctive appellation. In the more acute cases thin purulent matter is often mixed with the serosity. Vesications are less commonly observed in œdematous erysipelas, and the vesicles are smaller, less elevated, and more numerous than in either the simple or phlegmonous forms.

It is very liable in some situations to terminate in gangrene; this is announced by the redness changing to a livid hue, and by the cessation of pain. Hence, when erysipelas appears on the genital organs, or on dropsical limbs, when the skin is much distended, or when punctures have been made with the intention of allowing the fluid to drain off, gangrene frequently supervenes. When, therefore, it is deemed advisable to puncture dropsical parts, the best mode of preventing such consequences is to insert a fine couching needle under the skin at short distances. This mode has been found preferable to making small incisions with the lancet, in so far as it is seldom followed by erysipelas.

4. We shall next advert to some differences in the local and general symptoms of erysipelas, depending in some measure on the situation of the part on which it appears. It is a matter of daily observation, that when erysipelas occurs on the extremities, it is less severe than when it appears on the trunk; it is almost invariably confined to one limb, and seldom attended with danger, unless, from its proximity to any of the larger joints, articular inflammation arises, which may terminate in effusion, or some other consequence of synovial inflammation.

In no region of the body is erysipelas more formidable and dangerous than on the face and scalp. The severity arises chiefly from the inflammation of the brain or its membranes, which almost invariably supervenes. Erysipelas of the face or scalp (to which the name *sideratio* has been given) is preceded by two or three days' smart febrile indisposition. The redness appears on some part of the face, from which it gradually spreads: it is sometimes confined entirely to the side of the face in which it first appeared; but more generally it is diffused over the whole face, forehead, and scalp; and occasionally creeping down the neck, extends to the shoulders and trunk. In other cases it first appears round some slight wound, such as those made by leeches or by the cupping scarificator, or around the margin of a blister: sometimes it succeeds to an external injury of a more severe kind, a lacerated or contused wound of the scalp. As the disease advances, the face, and more particularly the eyelids, become swollen; the vessels of the head pulsate strongly; delirium, at first transient, but afterwards constant, comes on, succeeded by drowsiness, or coma; vesications or desquamation of the cuticle take place about the fourth day, after which the local and general symptoms abate: in more severe cases, however, the symptoms in the brain increase; the delirium increases; the patient either becomes furious, or falls into a state of perfect insensibility, and after lingering till the tenth or twelfth day, dies from the effects of cerebral inflammation. In other instances, in which the brain affection has been less intense, external abscesses form, most frequently on the eyelids: occasionally the matter becomes diffused in the cellular tissue of the scalp, or when the inflammation has terminated in gangrene, sloughing of this membrane takes place, the pericranium being often detached, to some extent, from the cranial bones. The parotid and cervical glands become inflamed in severe cases, and not unfrequently abscesses form in the cellular tissue in which they are embedded.

It is necessary to notice a form of pharyngeal inflammation which has been observed when erysipelas is prevalent at certain seasons, or appears in some localities as an epidemic. Some have described this affection as erysipelatous inflammation of the throat; and although this term conveys a pretty accurate idea of the nature of the disease, we think the application of the term erysipelas to inflammation of mucous membranes incorrect, inasmuch as the term ought to be restricted to cutaneous inflammation. In the affection to which we allude, though there is fever, and pain in the throat, especially on deglutition, there is little swelling, but general redness of the fauces.

Dr. Stevenson, (Med. Chir. Trans. of Edin. vol. ii.) who has given a condensed but good description of the disease as it appeared at Arbroath, states that in some cases the inflammation was confined to the fauces; in a few, however, it spread to the larynx, producing symptoms very like idiopathic croup; in others it extended to the pharynx and œsophagus, when he remarked that though fluids and solids could be partially swallowed without much apparent difficulty, after a few seconds the patient felt pain in the gullet, followed by inverted action and partial or complete rejection of the food. In the more protracted cases, swelling and suppuration of the cervical glands took place. It has been also remarked, that while in some individuals this affection was confined to the throat, in others, after commencing in the fauces, the inflammation spread to the face and head, giving rise to erysipelas when the cutaneous structure became affected. This circumstance, and the occurrence of this affection of the throat at the time when erysipelas was prevalent, besides the fact that in erysipelas of the face, the inflammation frequently spreads from the face to the mucous cavities of the nose and mouth, show that the diseases are essentially the same, modified only by the difference of the structure in which they occur.

In the London Fever Hospital, as well as in general hospitals, erysipelas is by no means uncommon. Of protracted cases of malignant fever especially, it is a frequent and dangerous consequence; and we have occasionally observed that the inflammation commenced and was confined entirely to the throat: more generally, however, the inflammation, after beginning in the throat, has spread from the mouth to the cheek and face, or through the nostrils to the nose, and thus erysipelas has been propagated to the face and head. When this form of pharyngeal inflammation is confined to the throat, it appears to us to be in some measure allied to the *Diphtherite* of which Bretonneau has given an excellent description. There is, however, no pellicular or membranous exudation, which forms the characteristic distinction of diphtherite—indeed, in several fatal cases, in which this pharyngeal inflammation was combined with erysipelas of the face and head, we have found scarcely any traces of the previous existence of inflammation. There cannot, however, be the slightest doubt of the inflammatory nature of the affection we are now describing, though it does not induce any of the morbid products of inflammation.

Although erysipelas seldom appears before the age of puberty, a severe form of it occasionally occurs in infants a few days after birth, sometimes, however, so late as the eighth or ninth week. Infantile erysipelas, as it is termed, is more common in lying-in hospitals than in private practice. It appears first on the lower part of the abdomen, or on the genital organs, and gradually extends down the thighs. The skin is not much swollen, but becomes hard and of a dark red or livid colour: vesication and gangrene follow, and the genitals are not unfrequently entirely destroyed. This form of erysipelas generally terminates fatally. A milder species is occasionally observed in the hands and feet, and sometimes about the neck or face. It generally lasts twelve or fourteen days, and then disappears, though sometimes it terminates by suppuration and the formation of small abscesses.

Nature of Erysipelas.—Great diversity of opinion has prevailed as to the true pathology of this disease, and consequently as to the mode of treatment to be pursued. The ancients attributed this, in common with every acute disease, to supposed acrimony of the fluids, which idea was apparently strengthened by the vesication which frequently arises in its progress, as well as its occasional termination in effusion, suppuration, or gangrene. The more rational and consistent views of pathology which the doctrines of solidism introduced, have tended in a great measure to throw discredit on the application of the humoral pathology to erysipelas.

From the history and progress of the disease which we have laid before the reader, the acute nature of erysipelas is apparent. We have seen in the local symptoms the most satisfactory proofs of inflammatory action—redness, heat, pain, and swelling: moreover, if we trace its termination in resolution, effusion, suppuration, and gangrene, the conclusion, according to the soundest principles of pathology, is, that wherever erysipelas appears, there is inflammation of the skin, or of the cutaneous and cellular tissue combined.

If we advert to the general or constitutional symptoms, we find they are exactly proportionate to the extent and intensity of the local affection. Again, we have stated, that in the more severe instances of phlegmonous erysipelas, inflammations of internal organs arise; and if the opinion of M. Ribes be correct, that in erysipelas the internal tunic of the veins and arteries of the integuments is inflamed, and that these vessels occasionally contain pus, we have a further corroboration of the inflammatory nature of the disease. It must, however, be kept in mind, that in one case the cutaneous inflammation may be so trivial as scarcely to produce disturbance in the system; in a second, the local symptoms are more severe, and accompanied with corresponding general excitement; in a third, the local symptoms may be acute, but the powers of the patient may be feeble, or the fever with which they are accompanied of the low or typhoid form. To us it appears that the conflicting and very opposite opinions which have been and still are entertained of the nature of erysipelas, would be brought to harmonize if more attention were paid to the prevailing character or type of the disease, the duration or stage when the practitioner is consulted, the age and individual peculiarities of the patient, and the treatment which has been adopted in the early commencement of the disease.

Though in the majority of instances the symptomatic fever is acute, such as always accompanies inflammatory diseases, yet, in many cases, especially in the aged, in persons addicted to intemperance, in those who are the subjects of organic disease—or when erysipelatous inflammation supervenes on protracted convalescence—moreover, at certain seasons or in particular years,—the local symptoms are attended with a low form of fever, which does not well bear active depletion, the modified antiphlogistic treatment being more successful. Indeed, as the disease advances, more generous diet, and, in some instances, the employment of stimulants, is found necessary.

This low symptomatic fever, however, is only occasionally observed; it forms the exception, not the rule, and leads to the practical inference, that this disease cannot be successfully treated upon one invariable principle; that the various circumstances pointed out should be kept in mind before we decide on its precise nature, and the line of treatment to be pursued. If the practitioner acts with the caution suggested, keeping in mind the principles we have laid down, he will seldom fail to form a proper judgment of any case he may be called on to treat. In fact, such variations of type are not peculiar to erysipelas; they are constantly observed in all febrile diseases. Epidemic fever, small-pox, measles, and scarlet-fever, vary much in their symptoms and general aspect at different times.

[There is great reason to regard erysipelas as an eruptive fever, and, consequently, a constitutional disorder, and, as such, it has been classed by the writer elsewhere: (*Practice of Medicine*, 2d edit. ii. 545, Philad. 1844. See, also, Alison's *Outlines of Pathology and Practice of Med.* Amer. edit. p. 276, Philad. 1844.) Local inflammation of a diffuse kind can, doubtless, be occasioned at all times by the application of certain irritants; but there is propriety in separating these purely local affections, and classing them under erythema. Whilst erysipelas is made to include the constitutional affection,—that, in other words, which does not occur unless under favouring conditions of the system,—which give occasion to the development of the exanthem in one person under influences that would be wholly inoperative in another. Such is the view of M. Chomel, who maintains, "that erysipelas is never the result of an external cause; or, at least, if an external cause concur in its production, it has but a secondary agency in its development. There must be the concurrence of an internal cause of a particular predisposition unknown to us."]

Causes.—It is in most instances difficult to trace the exciting causes of erysipelas. When it occurs after local injury, we have at once a probable reason for the surrounding integuments assuming inflammatory action: still, as erysipelatous inflammation does not succeed to external injury in every case, some other circumstances must concur to induce it in those instances in which it succeeds to accidents or operations. There is in many persons a disposition to inflammation of the skin on the most trivial irritation; in such there is, no doubt, some peculiarity in the vascular system of the integuments; so that any causes which excite the circulation either generally or locally, may induce erysipelas.

It is frequently dependent on gastric derangement, and from the intimate sympathy which exists between the skin and mucous membranes, irritation of the stomach and bowels may become not only a predisposing but an exciting cause, especially when there is susceptibility to this disease. On the other hand, the irritation in the skin during attacks of erysipelas frequently induces sympathetic disorder of the biliary and gastric system. Hence the origin of the term *bilious*, applied to those cases in which the erysipelatous inflammation is accompanied with gastric derangement.

Some persons, more particularly elderly persons of a cachectic habit, and females about the period of the cessation of catamenia, are liable to periodic attacks of the erysipelas, which are generally preceded or accompanied by symptoms of derangement in the stomach and bowels, but seldom with fever. When the erysipelatous inflammation in such cases appears on the extremities, it sometimes induces thickening of the skin, and occasionally superficial ulceration, which proves troublesome and tedious to heal.

Besides the origin of erysipelas from causes originating within the system itself, it appears to prevail more at certain seasons than at others. The spring and autumn are the periods of the year when it is most prevalent; it occasionally assumes an epidemic or endemic character, from which circumstance it has been supposed to be engendered by a particular condition of the air, or at all events to be materially influenced by atmospheric causes.

There have been at various times visitations of epidemic erysipelas. It appeared at Toulouse in 1716, when from its great fatality it was compared to the plague. De Haen, (Ratio Medendi) Bartholine, (Hist. Anatom. Rat. Hist. 56) Silvius de la Boe, (Prax. Med. Appendix, tract. x.) besides other writers, describe an epidemic erysipelatous fever, which was accompanied with inflammation in the stomach and duodeum.

Bromfield (Surgical Cases and Observations) mentions erysipelas of the head, which was epidemic for two years. Evacuations generally proving fatal, it was treated by bark and cordials.

[An epidemic erysipelas, known by the popular name of "*Black Tongue*," prevailed in some parts of Indiana, in the year 1843; an account of which was given by Dr. Geo. Sutton of Aurora, Indiana, (*Western Lancet*; Nov. 1843;) and "*erysipelatous fever*" occurred in the Northern section of Vermont and New Hampshire in the years 1842–3; which has been described by Drs. Charles Hall and George J. Dexter, (*Amer. Journ. of the Medical Sciences*, Jan. 1841,) and by Dr. J. A. Allen (*Boston Med. and Surg. Journal*, 1844.)]

When erysipelas is epidemic, it is severe and often fatal. The inmates of crowded establishments, more especially of hospitals for the reception of the sick, situated in the vicinity of those districts in which it is prevalent, are particularly liable to its attacks; and so long as the epidemic prevails, the slightest causes are often sufficient to produce the disease. It is, however, more likely to occur in those persons whose health has been previously broken by protracted diseases. It is also a frequent concomitant or consequence of fever treated in hospitals, though it rarely occurs among fever patients in the better class of society. When hospital erysipelas once appears in the wards, it is most difficult to prevent its spreading; and although it succeeds to operations, wounds, or injuries, or supervenes on some slight irritation of the skin, as, for instance, around the incision made by the lancet in venesection, or by the cupping scarificator, or appears around the leech-bites, or the margin of a blistered surface, it frequently arises spontaneously on various regions of the body, in patients whose local disease is not accompanied by an external wound. It has been sometimes so formidable in hospitals, as to render it necessary to shut up particular wards, and even to delay the performance of surgical operations, the most unimportant being at such times followed by severe and often fatal erysipelatous inflammations.

When erysipelas succeeds to external injuries, such as accidents or operations, it may often be traced to imprudence on the part of the patient, more particularly to errors of diet, or to mental or bodily excitement. In many instances the occurrence of erysipelas after operations or injuries, is the result of unskilful local or general treatment on the part of the surgeon, and more particularly of the neglect of the cooling antiphlogistic treatment during the constitutional excitement which generally follows capital operations.

Erysipelas may also arise from local irritation, long-continued or undue pressure, improper exercise of an inflamed part, or the application of stimulants or irritants to sound or ulcerated parts.

Well-authenticated facts warrant the conclusion, that under certain circumstances erysipelas may spread by contagion; rarely, however, in clean and properly ventilated dwellings. It is in vain to urge the fact of the disease spreading from person to person, as its propagation might be the consequence of exposure to the same causes; but when we find persons who, after becoming infected apparently from attendance on erysipelatous patients, remove as soon as they become ill to another residence at some distance, and communicate the disease to the family, the irresistible conclusion is, that erysipelas in such cases has been communicated by contagion.

Ample proofs of the truth of this opinion will be found on reference to the papers of Dr. Wells, (Transactions of a Society for the Improvement of Medical and Chirurgical knowledge, vol. ii.) Dr. Stevenson, (Transactions of the Medical Chirurgical Society of Edinburgh, vol. ii.) Dr. Gibson, (Ibid. vol. iii.) Mr. Arnot, (London Medical and Physical Journal, March 1827,) Mr. Lawrence, (Medico-Chirurgical Transactions of London, vol. xiv.) and others. A short abstract of the most striking facts is subjoined. Dr. Wells was called to attend an elderly man with erysipelas of the face, which proved fatal. His wife was seized with it a few days after his decease, and also died. Five weeks after, the landlady, who resided in the same house, had erysipelas of the face, but recovered. The nurse who attended the landlady was attacked with the same disease, and died in the parish work-house. The nephew of the person first attacked was taken with erysipelas shortly after visiting his uncle, and died in a few days.

In another case which subsequently came under Dr. Wells's observation, the patient had been for some time at the bed-side of a female friend who had erysipelas of the face, which proved fatal. Two sisters of this lady, two servants of the family, one of whom had acted in the capacity of nurse, had all the same disorder. Dr. Wells states, in explanation of these facts being regarded as indicating only the great prevalence of erysipelas from some general cause, that he saw no more than two other instances of the disease during the time they happened.

A person, with erysipelas of the face was brought to St. Thomas's Hospital, where he died. From inadvertence, another patient having a different disease was put into the same bed, before it was properly aired; soon afterwards this patient had erysipelas of the face. Several other persons about this time were attacked with this disease, among whom was an upper nurse or sister, to whom it proved fatal.

A lady was attacked with fever immediately after delivery, accompanied with erysipelatous inflammation of the skin. The infant was seized three days after birth with erysipelas about the pudenda, which spread to other parts of the body and even to the face. Both the mother and infant died after a few days' illness. The lady's mother and servant-maid, both of whom had nursed the infant, were seized with erysipelas of the face, from which both recovered.

Dr. Stevenson details briefly the results of twenty-one cases of erysipelas, which occurred in his practice in 1821-2. It spread, in many instances, through the members of the same family; in some it appeared soon after visiting friends or relatives during the period of the disease. A person who was attacked while in attendance on an erysipelatous patient went home to her parents, who resided at some distance, as soon as she was taken ill: they were soon successively seized, and the mother died in a few days.

In corroboration of these facts, Dr. Gibson brings forward other instances which came under his observation in 1822.

A young man with erysipelas of the face, was brought to his father's house at the distance of some miles. He ultimately recovered. His master had died a few days before of a febrile disease. The father of this young man was attacked with erysipelas in both hands and arms, which spread to the face. He died in a few days.

The infant son of a gentleman was seized with erysipelas on one foot. The mother was afterwards seized with erysipelas of the face and scalp. The nurse, who suckled the child, was seized with symptoms of pneumonia, and was removed to her father's house four miles off. Her father, who had some days before her arrival received a wound of the scalp, was seized with erysipelas of the face and scalp, and died soon afterwards. A sister living in the same cottage, had fever with sore throat, from which she slowly recovered. Two children in the same house were cut off with what appeared to be croup. The disease in the sister and children was no doubt erysipelatous inflammation of the fauces and trachea.

The next case resembles that related in the paper of Dr. Wells. A woman was admitted into the infirmary of Montrose, with suppuration of the hand, which had followed an attack of erysipelas. Some days after her admission, the patients in the two beds next to her were seized with erysipelas. It was afterwards found that, notwithstanding all the patients were removed from that ward, and the process of cleansing, white-washing, and fumigation adopted, the disease again reappeared when fresh patients were placed in this ward, so that it became at length necessary to shut up the infirmary for a time.

Mr. Lawrence mentions an instance in which erysipelas of the face, caused by a seton in the neck, seems to have affected two individuals by contagion, producing erysipelas of the face in one, and of the lower extremities in the other.

Diagnosis.—There are few external diseases which, from their resemblance to erysipelas, are likely to render the diagnosis perplexing. The diffused rosy tint of the skin, the uniform swelling, the peculiar burning pains, the tendency of the disease to spread, the vesication or desquamation of the cuticle, and the undefined suppuration and sloughing of the cellular tissue in the advanced stages, are sufficient to point out its nature, and to distinguish it from phlegmon.

Prognosis. Many general as well as particular considerations influence the prognosis. Some varieties of the disease are more dangerous than others. Simple erysipelas is always a mild disorder; the phlegmonous and œdematous forms are generally severe, often fatal. When the inflammation is extensive, and terminates in gangrene and sloughing of the skin and cellular membrane, the powers of the patient often give way under the disease. It is more dangerous in some situations of the body than in others; for instance, when it attacks the face and head, there is great danger; when it occurs on the chest or abdomen, it is more hazardous than on the extremities.

As a general rule it is more dangerous in elderly than in young persons. Infantile erysipelas is an exception to this remark; this form being extremely fatal, more especially that which commences about the genital organs, and spreads upwards over the abdomen and down the thighs.

Any disease with which the erysipelatous inflammation is complicated, has an important influence on the prognosis. When it occurs in persons who have organic disease; when it attacks convalescents from long-continued acute affections, or those whose strength is exhausted by chronic disease; when it occurs on the extremities of dropsical subjects, or after severe injuries or surgical operations, the result is doubtful, and therefore the prognosis should be guarded. If again, during the progress of the erysipelas, the brain or any other important organ become inflamed, more especially if the inflammation suddenly leave the skin and is followed by symptoms of internal inflammation, there is considerable danger, unless the most vigilant treatment be adopted. Hence in erysipelas of the head, the state of the brain should be minutely watched. When it appears on the chest, the pulmonary organs sometimes become inflamed; or when it spreads to the abdomen, inflammation of the peritoneum or mucous membrane of the intestines sometimes takes place.

Lastly, when erysipelas prevails epidemically, the disease is usually more severe and fatal than when it is sporadic. It is also more fatal at certain periods than at others, from causes which are unknown.

Treatment.—From the account which has been given of the different forms of erysipelas, and from the various conditions of the system under which it takes place, it is evident that the principles of treatment require to be modified according to the symptoms and the circumstances of each case; hence it will be proper to consider the age of the patient, the state of the general powers, the type of the accompanying fever, the seat and intensity of the erysipelatous inflammation, and particularly the duration of the disease.

It is known from experience, that acute disorders do not always bear the same treatment; and this remark applies equally to erysipelatous inflammation. Hence, at one time, strict antiphlogistic treatment may be necessary, while at another period, the system will not bear the same bold measures, although a modification of the same curative principles be indicated. Consequently, in one case it may be necessary to bleed generally and locally,—often to a considerable extent; a second may require topical bloodletting only; in a third, the symptoms often yield to mild purging, saline medicines, and abstinence; in a fourth, from the depression of the system, it may be necessary to administer nourishment and even stimulants, while at the same time blood is taken from the inflamed surface; in a fifth case, powerful cordials are required to support the sinking powers. It may, however, be affirmed that, in the majority of instances, the disease requires antiphlogistic treatment.*

We shall notice the measures to be adopted in the different varieties of erysipelas.

1. Simple erysipelas, being only a very slight form of cutaneous inflammation, in general yields readily to aperients and cooling remedies. If the erysipelas appear on the extremities it will be necessary not only to abstain from using the limb, but to keep it in the horizontal posture, and to avoid any causes of local irritation, more especially friction. In some cases it may be necessary to apply leeches, and afterwards warm fomentations, or a tepid lotion. Puncturing the inflamed skin with the point of a lancet is a very good mode of local bleeding in slight cases, and may be resorted to in preference to the application of leeches.

2. Phlegmonous erysipelas is, of all the forms of the disease, the most acute, both as regards the local symptoms and the inflammatory type of the fever with which it is accompanied.

The whole aspect of the disease is such as at once to indicate the necessity for active measures.

In general, bloodletting is indispensable; and when the disease occurs in the face and scalp, it is necessary to bleed largely and repeatedly till the headach and other symptoms denoting cerebral affection are removed. Local depletion by cupping or leeches, and the application of a cold lotion to the scalp, will form a good auxiliary to the use of the lancet, and in some instances may entirely supersede general bloodletting; indeed, Mr. Lawrence seems disposed to consider the local abstraction of blood more serviceable than venesection.

Active purgatives, antimonial preparations, cooling drinks, abstinence from animal food of every kind, as well as from wine and fermented liquors, and quietude of body and mind, constitute the general summary of the means to be pursued in the commencement of this form of erysipelas. This active treatment is required only when the patient is young and plethoric, and when the local and general excitement is such as to warrant its adoption.

Phlegmonous erysipelas occurs not unfrequently in persons advanced in life, or in individuals whose powers are feeble; in such cases, and in the later stages of the disease, the active measures just recommended would not only be injudicious but positively injurious. In the instances alluded to, the local symptoms may exhibit more or less activity, but still the general powers are weak; topical bleeding therefore, if the powers permit, while we endeavour to sustain the system by nourishment and small quantities of cordials, regulating at the same time the bowels and the various functions according to particular indications, will give the patient the best chance of recovery. Cold applications, composed of equal parts of diluted alcohol, solution of acetate of ammonia and of water, or a lotion consisting of one drachm of carbonate of ammonia and one of superacetate of lead dissolved in a pint of rose-water, seem to have considerable influence in arresting the processes of effusion and suppuration.

If the erysipelatous inflammation do not yield to the active measures recommended, or if the practitioner be not consulted till the advanced stage of the disease, further depletion will not arrest its progress, but only exhaust the powers of the patient.

The constitutional excitement which characterized the early stage of the disease is succeeded by marks of impaired energy, while the inflammation of the skin and cellular tissue is followed by suppuration and sloughing; and these destructive processes not unfrequently extend over the greater portion of a limb, purulent matter being infiltrated through the subcutaneous cellular tissue. There is no outlet for the matter unless by sloughing of the skin. Under these circumstances, the practice of making incisions into the diseased parts has been recommended. This plan was suggested many years ago by various writers on surgery, but first practised in this country by Mr. Copeland Hutchison. In his Practical Observations on Surgery, he recommends these incisions to be made about an inch and a half in length, from two to four inches apart, and varied in number from four to eighteen, according to the extent of surface the disease is found to occupy.

From these incisions fifteen to twenty ounces of blood will generally flow, relieving the tension of the skin and at the same time giving exit to the pus.

Mr. Lawrence (Med. Chir. Trans. vol. xiv.) recommends, in preference to these numerous incisions, one or two long incisions carried through the middle of the inflamed part, in a direction pa rallel to the long axis of the limb. "These incisions," he says, "are followed very quickly, and sometimes almost instantaneously, by relief and cessation of the pain and tension; and the alleviation of the local suffering is accompanied by a corresponding interruption of the inflammation, whether it be in the stage of effusion, or in the more advanced period of suppuration and sloughing.

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* Oportet, si vires patiuntur, sanguinem mittere; deinde imponere simul reprimentia et refrigerantia.—*Celsus de Medicini*, lib. v. cap. 25.

"The treatment by incisions," he adds, "is suited to various stages of the complaint; but it is employed to the greatest advantage at the beginning, since it prevents the further extension of inflammation, and the occurrence of suppuration and sloughing. At a more advanced period, the incisions limit the extent of suppuration and gangrene, and at a still later time they afford the readiest outlet for matter and sloughs, and facilitate the commencement and progress of granulation and cicatrization."

Mr. Lawrence does not advise incisions in erysipelas generally, but confines their employment to cases of the phlegmonous kind. This treatment, therefore, is more applicable to erysipelas of the limbs than to the disease when it occurs either on the face and scalp, or on the trunk.

After the incisions, warm fomentations should be applied till the bleeding has ceased; the part should then be enveloped in a warm bread poultice. If the surface of the wound do not discharge freely, it should be dressed, under the poultice, with lint thickly spread with resinous or some other stimulating ointment. When suppuration is established, the matter finds a free discharge at the incision, large portions of cellular membrane are thrown off; and when this process is finished, pressure by a bandage is very useful in promoting the healing process.

Though the bleeding, which takes place from the incisions, is generally serviceable in arresting the inflammatory process, it should not be checked so long as the pulse is unaffected. The following passage from Mr. Lawrence's paper contains a valuable practical caution. "The great extent to which the hemorrhage may proceed, renders it necessary that we should act very cautiously, especially in elderly persons, or in those whose strength is already impaired by the disease or previous treatment. The patient should be closely watched in such cases until the bleeding has ceased. Should it become necessary to stop the further loss of blood, this may be readily accomplished by tying any bleeding vessels, or placing the limb in an elevated position, or by pressure."

It will be necessary in most instances to allow nutritious diet, and sometimes a little wine, to support the powers under the process of suppuration and granulation. We have occasionally found it necessary to give wine, and even brandy, immediately after the incisions, when the patient has been exhausted by the hemorrhage; but stimulants should be withdrawn after the powers have been restored.

Further experience has confirmed the efficacy of this mode of treatment in cases of phlegmonous erysipelas, and, were testimony in support of the practice required, several instances which have been treated by incisions under the directions of the writer of this article might be adduced.

In some cases of erysipelas the accompanying fever is attended with symptoms of gastric irritation; the patient feels hot and flushed; the tongue is red at the point and margin, the body of it being coated with yellow moist fur; there is a bitter taste in the mouth, often accompanied with vomiting of bilious fluid, or diarrhœa.

If the pulse be full, and the general aspect of the symptoms denote acute fever, venesection and leeches to the epigastrium will, in general, quiet the gastric irritation, and relieve at the same time the local inflammation.

3. In the œdematous form of erysipelas the local disease is certainly inflammatory; but the constitutional excitement is seldom such as to warrant those depleting measures which are necessary in the more acute forms. Mild aperients, confinement to the horizontal posture, warm fomentations to the affected parts, and a restricted regimen, comprise all that is in general necessary in the treatment of œdematous erysipelas in its early stage. If the skin of the affected parts feel hot and painful, the application of leeches will be serviceable. Towards the decline of the disease, tonics, especially the sulphate of quinine, with a mild nutritious diet, will be useful.

When erysipelas terminates in gangrene, bark, wine, and opium, with the occasional exhibition of mild aperients, are to be exhibited according to circumstances.

4. In infantile erysipelas, the child's strength should be supported by means of a good nurse. If the milk of the mother be not sufficient, a wet-nurse must be procured, and cordials, such as white wine-whey, small doses of quinine, and sometimes of ammonia, administered.

5. The tendency of erysipelas to become erratic, or to migrate from one part of the surface to another, has been pointed out. We have also alluded to cases in which the inflammation, after suddenly leaving the skin, has been followed by inflammation of some internal part. When this happens, the organ which has become diseased is to be treated on the same principles as when this inflammation occurs from other causes, while sinapisms are applied to those parts of the skin from which the erysipelas has receded. It is therefore necessary, in all cases of erratic erysipelas, to watch the condition of the internal organs, and to treat with promptitude and decision the symptoms of internal inflammation on their first approach, always, however, keeping in view the general powers of the patient.

6. When erysipelas supervenes on convalescence from other diseases, the treatment must be regulated according to the circumstances of the case. When it attacks convalescents from fever, it always retards, if it do not render the recovery doubtful. We have seen great benefit in such cases from abstracting blood on the very first appearance of the redness, by making numerous punctures with the lancet, and promoting the bleeding by warm fomentations. In several instances, this practice has at once put a stop to the disease. When it has proceeded after this local bleeding, a cooling plan of treatment with moderate support in cases of great debility, should be prescribed. In elderly persons stimulants, such as sulphate of quinine, ammonia, with wine and cordials, are often necessary.

Some continental surgeons have recommended the application of vesicants and escharotics as local remedies in erysipelas. Dupuytren employs blisters to the affected portions of skin in the second stage of phlegmonous erysipelas. M. Larrey reports favourably of the efficacy of slight cauterization of the surface in traumatic erysipelas.

Mr. Higginbottom, of Nottingham, more recently, has recommended the application of nitrate of silver, with the view of arresting the spreading of erysipelatous inflammation. He conceives that the influence of this remedy (as an external application) is not confined to the textures constituting the skin, but that it extends to the cellular substance, and even to the parts more deeply seated. This remedy is not to supersede active treatment when necessary. It is to be applied in the following manner. The part is to be first washed with soap and water, to remove any oily substance from the skin, and afterwards wiped dry; the inflamed and surrounding skin is to be then moistened, taking care that not only every part of the inflamed skin be touched, but the surrounding healthy skin, to the extent of an inch or more beyond it. The nitrate of silver is to be passed over these surfaces once, twice, thrice, in common cases, and more frequently if rapid vesication be required. After the application, the part is to be exposed to the air to dry, and is to be kept cool. Mr. Higginbottom has given, in his work, several cases illustrative of the efficacy of this plan of treatment. (See an Essay on the Use of Nitrate of Silver in the Cure of Inflammation, Wounds, and Ulcers, by John Higginbottom.)

Compression by a well applied bandage has been employed in the later stages of erysipelas. From what we have witnessed, we are by no means inclined to advise this mode of treatment. If inflammation of the skin and cellular tissue still remain, pressure must prove most injurious; and if there be infiltration of pus in the cellular tissue, it can be of no avail. We have seen more than one case of erysipelas, in which gangrene was induced within twelve hours after a bandage was applied. The only form in which it can be at all admissible, is in the suppurative stage of phlegmonous erysipelas, as already recommended, and in the chronic stage of œdematous erysipelas, after the inflammation has disappeared from the skin, when the limb continues enlarged from œdematous effusion into the cellular tissue.

[Mr. Davies (*Practical Remarks on the Use of Iodine locally applied*, Amer. Lib. edit. 1839–40) has recommended in the same cases the tincture of iodine diluted with two parts of alcohol to one of the tincture, and applied over the affected parts by means of a camel's-hair pencil. It seems to act like the nitrate of silver, forming a coating over the inflamed surface, and thus protecting it from the air, whilst, at the same time, it acts as an excitant to the over-dilated capillaries. In local erysipelas, the writer has often found it markedly advantageous; and M. Velpeau (Braithwaite's *Retrospect*, July to Dec. 1842, p. 117, Lond. 1843) has observed a solution of sulphate of iron in the proportion of an ounce to a pint of water, or an ointment of the same, in the proportion of a drachm to an ounce of lard of great service.

A few years ago, the application of mercurial ointment to the inflamed parts was brought forward with high encomiums, and was extensively used, (T. Nunneley, *Treatise, &c. on Erysipelas*, Amer. edit. p. 214, Philad. 1844); but the writer has not been able to notice any better effects from it than from greasy applications in general, whilst it has at times acted as an irritant when the latter might have not.

Except, however, in local erysipelas, the writer is not in the habit of employing topical remedies to the inflamed part. He has found decided benefit from carefully excluding the air from it by covering it with carded cotton, as in cases of burns and scalds. The great object would seem to be, to remove the constitutional affection of which the exanthem is only a functional expression, like the eruption of small-pox, measles, or scarlatina. It must be borne in mind, that this is largely neuropathic, and that great benefit often results from agents that would be justly esteemed questionable in ordinary inflammation. A recent writer of authority, Dr. Robert Williams, (*Elements of Medicine*,) states, that the mode in which he is in the habit of treating "idiopathic erysipelas, whatever may be the part affected, or with whatever symptoms it may be accompanied," is as follows: the patient is put on milk diet; the bowels are gently opened, and from four to six ounces of port-wine, together with sago, are allowed daily. "This mode of treatment," he says, "it is seldom necessary to vary throughout the whole course of the disease; for the delirium, if present, is generally tranquillized; if absent, prevented; the tongue more rarely becomes brown, or only continues so for a few hours; while the local disease seldom passes into suppuration or gangrene. In a word, all the symptoms are mitigated, and the course of the disease shortened. I have pursued this system," he adds, "for several years, and I hardly remember a case in which it has not been successful." Dr. Williams does not limit the quantity of wine to that above stated. In more severe cases, where the local affection continues to extend, and the delirium to augment, he increases the wine to eight ounces, and adds quinia to it.]

A. Tweedie.

ERYTHEMA, (from the Greek *ἐρύθημα*, redness,) is one of those nosological terms which has been made use of in various significations by different writers, and its application is, even at the present moment, in some degree vague and arbitrary.

Hippocrates used it in the general sense of a morbid redness of the skin, of any kind, for which, at a later period, Celsus, and, after him, Galen, substituted the term erysipelas; and hence, perhaps, arose a good part of the confusion which we meet with in the subsequent application of the terms. In the system of Sauvages, erythema is synonymous with idiopathic erysipelas. Cullen says, "when the disease is an affection of the skin alone, and very little of the whole system, or when the affection of the system is only symptomatical of the external inflammation," it is erythema; "but when the external inflammation is an exanthema and symptomatical of an affection of the whole system," he calls it erysipelas; and with this Mason Good nearly coincides, applying the former appellation to a local cutaneous inflammation tending to vesication, and the latter to an idiopathic fever producing an erythematic efflorescence. Callisen implies by erythema the lowest degree of erysipelas; and with Rostan, in like manner, it means this same disease in its simplest form. J. P. Frank, however, employs it in a very different signification, confining its use to a morbid redness of the skin, of a chronic nature; but in this he is peculiar; at least it is not the sense in which it has been employed by the majority of his countrymen. In Germany, indeed, it seems for the most part to have been confounded, along with some other cutaneous affections, under the common head of erysipelas, (*Rose, Rothlauf,* &c.) till Rust (Magazin für d. ges. heilkunde. b. viii.) restrained the use of the term erysipelas to that species of cutaneous efflorescence which is accompanied with fever, and dependent on disorders of the digestive organs, and drew a line of distinction between this and a similar-looking inflammation of the skin, originating in some local irritation (as excess of cold or heat, chemical agents, or slight wounds,) or in a morbid state of some of the subjacent structures, (as inflammation of membranous expansions, metastatic depositions into the cellular membrane, periosteum, or glands, &c.) This latter affection, whether idiopathic or symptomatic, Rust has distinguished by the appellation pseudo-erysipelas, and it evidently coincides very nearly with the "erythematic inflammation" of many medical and surgical writers in our own country.

In Willan's arrangement, erythema signifies "a nearly continuous redness of some portion of the skin attended with disorder of the constitution, but not contagious;" to which Bateman adds, "it differs from erysipelas inasmuch as it is a mere rash or efflorescence, and is not accompanied by any swelling, vesication, or regular fever."

Rayer defines it to be a superficial inflammation of the skin, characterized by morbid redness and heat, and the absence for the most part of papulæ, vesicles, and pustules; and in his latest work he says it is the first stage of a number of cutaneous affections, but when permanent it constitutes in itself a distinct disease; and Billard adds, that as it often ushers in other cutaneous diseases, so it occasionally also forms their termination. Rayer thinks Bateman has fallen into an error in attributing such formidable symptoms as he does to some of his varieties of erythema, as they ought to be referred, not to this trivial inflammation, which is in itself productive of no danger, but to the coexistence of internal affections, chiefly inflammations of the mucous membrane of the stomach and intestines. These, which not unfrequently complicate it, have, he asserts, been overlooked by our English pathologist. The accusation, however, does not appear to us altogether well founded, as Bateman sets out by saying that erythema, like roseola, is commonly only a secondary affection—a mere symptom, though often the most prominent one, of dyspepsia, disorder of the bowels, and other internal derangements.

Having thus passed in review most of the significations which have at various times been attached to the term erythema, we have only to add, that the sense into which it has gradually been subsiding in these countries, and in which we mean to employ it here, is that of a superficial inflammation of the skin, which is red and occasionally hot and itchy, but without vesication or obvious swelling. We shall adopt the primary subdivisions of this affection which have been employed by Rayer, viz. into idiopathic and symptomatic, as at once more comprehensive and more practical than those of Willan and Bateman, all of whose six varieties are easily reducible to the second of the above heads. In reference to treatment, the division into acute and chronic is also most important, and should never be lost sight of in the management of an individual case.

IDIOPATHIC OR LOCAL ERYTHEMA is often traceable to some obvious cause of topical irritation, as friction or pressure, extremities of heat or cold, the stings of insects, chemical irritants, distension of the integuments, or, finally, to the inflammation excited on the surface of the neighbouring skin by the existence of some papular, vesicular, or pustular eruption, or by wounds, ulcers, &c.

Of erythema induced by friction (intertrigo), we have a familiar example in that chafing of the skin which occurs especially in fat persons who are inattentive to personal cleanliness. The parts where it usually takes place are about the axillæ, groins, inner and upper part of the thighs, and in the cleft of the nates. It depends on the attrition of the contiguous surfaces in these situations, where the skin is of a delicate texture, and where there is considerable moisture or sebaceous secretion, and much movement of the parts. It very often makes its appearance behind the ears of infants, as well as in the folds of the neck, about the pudenda, back of the knees, &c. The irritated parts secrete in abundance a pale viscid fluid, even before they are excoriated or ulcerated, which concretes into scabs, and seems to be a modification of the secretion of the sebaceous follicles which are very much developed in infants at birth. The itching and irritation of intertrigo in young children is occasionally so considerable as to interfere materially with their rest.

Where the redness is intense, and confined to the circumference of the anus, and a considerable diarrhœa coexists, we may generally consider it as the result of this affection, and produced either by an extension of the inflammation of the mucous membrane of the rectum to the adjacent skin, or by the repeated application of discharges of an unnatural and stimulating quality. A similar irritation and redness occasionally occurs in a chronic form about the verge of the rectum in adults. It is accompanied with distressing itching, and seems for the most part to be connected with deranged action of the stomach and bowels. As it is often accompanied by a copious secretion, which concretes into scales, it is probably more closely allied to eczema than to the subject of the present article, though in many cases it is very doubtful to which it should be referred. (See ECZEMA.) When the redness about the anus and genitals of infants is of a somewhat coppery or livid hue, and resists frequent ablutions and the other simple means usually employed by nurses, we must investigate the case accurately, and ascertain whether the parents or nurse labour under the suspicion of syphilis in any of its forms.

Erythema often makes its appearance on the cheeks of infants during the period of dentition, and in the neighbourhood of the umbilicus while the cord is sloughing off.

Of the erythematous redness induced by pressure we have familiar examples in the effects of a tight shoe,—of a long ride on one unaccustomed to it,—of protracted confinement to bed and constant lying on the same points of the body. (E. Paratrima of Sauvages.)

Of that caused by extremes of temperature we have instances in the redness of chilblains, and of slight burns and scalds.

The chemical irritants capable of inducing it are numberless. Ammoniacal and other stimulating liniments, blisters, pitch-plasters, sinapisms, turpentine, washes containing lead, and even the long-continued application of linseed poultices, occasionally produce this eruption in very irritable skins. In many instances, however, the presence of vesicles may be detected, and such cases will fall under the head of eczema. The long-continued or repeated application of the urine which occurs in certain diseases of the bladder and urethra; of the fæces in dysentery; or of both, in young infants who are not kept with a sufficient attention to cleanliness; as also the contact of gonorrhœal, leucorrhœal, and other morbid discharges, are frequent causes of this affection of the skin: even the long retention of the natural secretion of the sebaceous follicles around the corona glandis, by becoming rancid and acquiring irritating qualities, may give rise to this inflammation in the prepuce.

We have examples of the influence of distension of the skin in producing erythema, in the redness which sometimes manifests itself over the surface of the most prominent part of tumours, aneurismal and others, of rapid growth; and to this distension may, perhaps, be referred in part the blush of redness which indicates to the surgeon the existence of deep-seated matter, the inflammation of tendinous fasciæ, periosteum, &c.; though, doubtless, much of this depends on sympathy of the vessels of the skin with those of the subjacent parts. The red lines which occur over the track of inflamed absorbents and veins are of a similar nature, as well as the diffused blush over a joint suffering from acute rheumatism or gout. To distension, too, we must attribute the superficial inflammation which so often attacks dropsical parts, especially the lower extremities and scrotum, the skin being put greatly on the stretch by the serous effusion into the cellular membrane. As the anasarca declines, this usually terminates in extensive desquamation of the cuticle; but in less favourable cases, especially in elderly and intemperate people, whose constitutions are exhausted by violent or long-continued diseases of the chest or abdomen, the efflorescence often assumes a dark red or livid hue, and gangrenous ulcers ensue; a termination which is sometimes accelerated by the injudicious use of scarification, or by an improper mode of performing this operation. In those cases where it is desirable to drain off the water in anasarca, punctures with a lancet are, as Mr. Pott long since pointed out, much preferable to incisions, as they are equally effectual in giving passage to the fluid, and are much less likely to inflame or become gangrenous,—a result which there is so much reason to dread in dropsical habits. Pott gives three cases in which the whole integuments of the penis and scrotum, which were greatly distended by serous infiltration, sloughed off, in consequence of incisions instead of punctures having been made into the swollen parts. M. Fouquier finds that gangrenous inflammation is least apt to ensue when the punctures have been made deep, by plunging the lancet quite through the skin and freely into the cellular membrane. The greater safety of this proceeding may, perhaps, be ascribed to its being more effectual in draining off the water, and thus more rapidly relaxing the integuments, and relieving that state of tension which predisposes to inflammatory action. It has lately been recommended by Dr. Marsh to perforate the anasarcous swelling in several points with a cataract needle, after which the serum will continue for many days to exude abundantly, and from the smallness of the wound inflicted the risk of inflammation will be much diminished.

Of the erythematous redness induced by the irritation of vesicular, papular, and pustular eruptions, we see frequent examples. Thus the areola of the vaccine vesicle sometimes extends to a considerable distance, so as to cover the greater part of the arm, and in some rare cases even the breast, back, neck, and face. When so extensive, it has usually been described as a species of erysipelas, and is accompanied with a considerable degree of stiffness and difficulty in the motion of the parts affected, with some feverishness and occasional enlargement of the axillary glands. It has been known to turn livid, and has then been sometimes attended with fatal debility. Bateman, we are aware, has classed this affection under roseola. We are not desirous of displacing it, but rest content with pointing out its affinity to the genus under consideration, to which by its origin, apparently from the local irritation of the skin, and by its spreading in a continuous manner, it seems to be very closely allied. Indeed, no very accurate line of distinction is drawn by Bateman between roseola and erythema; and Plumbe has treated of them both together as mere symptoms of internal or constitutional disorder. According to Rayer the inflammation of erythema is of a deeper red and more pronounced character than that of roseola, and sometimes extends to the cellular membrane, or becomes chronic, neither of which is ever the case in the latter. The spots are moreover generally larger, but less numerous than in roseola, in which last they often occur simultaneously in almost every part of the body. After all, we think that these affections graduate insensibly into one another, and that innumerable cases present themselves in practice which are equally referable to either.

The extensive redness which accompanies some species of strophulus and lichen exemplifies the connection of erythema with a papular disease.

One species of acne (gutta rosea) is usually complicated with a diffuse redness, which is of so striking a character, as to have led Frank, though incorrectly, to class this pustulo-tubercular affection under the head of erythema. The affected parts of the face, in addition to the characteristic suppurating tubercles, present a shining redness, and occasionally an irregular granulated surface, generally commencing at the point of the nose and gradually spreading to the neighbouring part of the cheeks, and frequently attacking also the forehead and chin. After some years the skin assumes a rough and thickened appearance, and is traversed by a net-work of enlarged veins. It seems often to depend on derangement of the digestive organs, and a peculiar irritability of the stomach in particular; but these are rarely so well marked or so clearly characterized as to enable us accurately to discriminate, or to justify us in attempting to separate, in our classification, the symptomatic from the strictly local examples of this affection. The vividness of the colour of the eruption is greatly increased immediately after making use of any warm or stimulant food or drink, sitting opposite a hot fire, long-continued exposure of the face to the sun's rays, violent exercise, much stooping, reading or writing soon after meals, straining the eyes on minute objects, derangement of the stomach, constipation, or in fine, any of those causes which produce a temporary determination of blood to the head. In young persons who inherit this complaint, it appears in the form of red patches of an irregular shape on the face, from which scurfy exfoliations of cuticle take place from time to time, but the tubercles do not usually appear till a later period. Unless, however, there is a very decided hereditary predisposition to it, or habitual intemperance, it does not usually show itself till middle life. As the person advances in age, the nose becomes swollen and of a fiery red, the nostrils dilated, and the skin assumes a lobular or tuberculated aspect, with considerable development of the sebaceous follicles which abound in this part. In a case in St. Bartholomew's Hospital in which the nose had from this cause a very unreasonable and inconvenient magnitude, we witnessed the removal of a portion of it by the knife, with considerable improvement to the physiognomy.

According to Frank's definition of erythema, which seems to be entirely drawn from the affection which we have just described, it is a superficial, habitually recurring, or permanent chronic redness of the skin, which grows pale on pressure, and is attended with a sense of itching, heat, and tension, with little real tumefaction or tendency to suppuration. He adds that it may be either smooth or studded with tubercles, and is very frequently accompanied with a furfuraceous exfoliation of the cuticle, and he points out the legs and face as its most frequent situation. As long as it is not repelled from the surface, he considers it usually unimportant. The skin becomes thickened, hardened, and deformed by its frequent recurrence. With many it continues throughout life, and with others returns almost periodically, without any evident lesion of other functions of the body. On desquamating, it leaves the skin in a state of increased sensibility, and prone to subsequent attacks. Its causes, he conceives, differ little from those of erysipelas, save in degree and permanence. The passionate, intemperate, and feeble are most liable to it, and suppression of the menses, of hemorrhoids, or of an habitual perspiration in the feet or axillæ occasionally give rise to it.

In the case of irritable wounds, leech-bites, ulcers, issues, setons, and blisters long kept open, the inflammation frequently extends from them to the surrounding skin, and manifests itself by a blush of redness which disappears on pressure. This, when accompanied neither by obvious tumefaction nor tendency to vesication, we should class under the head of erythematous inflammation, rather than under the formidable name of erysipelas, which is frequently bestowed upon it. In a practical point of view, it is desirable that an affection of so slight a nature and requiring so little treatment should have a distinct and appropriate appellation.

Into that species of erythematous efflorescence accompanied with a boggy intumescence of the subjacent cellular membrane, which occasionally supervenes upon wounds received in dissection, we do not mean to enter here, as the dangerous affection of which it is but one out of many more formidable symptoms, will be treated of in another place.

The disease which has been described by some writer under the name of *erythema mercuriale* is a vesicular disease, and will therefore be found under the head of Eczema.

The *treatment* of idiopathic erythema is generally simple. That arising from the chafing of contiguous surfaces may be prevented, for the most part, by assiduous attention to cleanliness, frequent washing with cold water, and the occasional use of the tepid bath. If excoriation has been already induced, emollient applications, as decoction of bran or of marsh-mallows, or a simple ointment, will generally suffice for its cure. In some individuals, however, ointments and greasy applications generally prove irritating, causing an increase of inflammation, and promoting suppuration of the denuded surface. When the part is very painful and considerably inflamed, a solution of the nitrate of silver affords one of the most healing, and after the momentary suffering immediately ensuing upon its use is over, one of the most soothing applications. Fat persons who have been in a state of torture after a long walk, or a hard day's shooting, have often found instant relief from this remedy. Keeping the part constantly wet with Goulard's lotion is also very effectual.

The intertrigo occurring behind the ears in infants generally requires little more than scrupulous attention to cleanliness, and the interposition of a singed rag to absorb moisture. Such sores as form in this situation, if kept constantly moistened with a weak solution of the acetate of lead, will usually heal rapidly. Most authors, however, caution us against drying them up, dreading from such imprudence the occurrence of ophthalmiæ, inflammations of the brain, stomach, or intestines, or some other serious complaint; but by taking care to induce a somewhat freer state of the bowels whilst healing these sores, and by slightly reducing the quantity of the child's food, we shall probably in most instances obviate all dangers from this source. In all cases, however, we should endeavour, by attention to cleanliness, to prevent the affection ever going so far that either its existence should be productive of much inconvenience, or its removal of much risk. The advocates of the prophylactic virtues of such sores should be made aware that they often become in themselves, from their painfulness and fœtor, and the swelling of the cervical glands which they induce, very troublesome ailments; and that they have even, in some cases, been known to prove fatal by the extension of the inflammation to the internal ear, and to the brain. The sores, too, occasionally become livid and gangrenous, and the child sinks even before the sloughs have separated—a termination which has been mentioned by Burns, who in such cases dwells on the necessity of directing all our efforts to supporting the strength, regulating the bowels, and counteracting the tendency to mortification by the application of camphorated spirits, the fermenting poultice, &c.

Where intertrigo makes its appearance in the folds of the neck, about the arm-pits, groins, or hams, daily bathing, and the occasional exposure of the parts to the air, together with sprinkling them with some unirritating absorbent powder, as tutty, levigated chalk or starch, is all that is usually necessary. Chausier and Plenck caution us against the use of cerusse (carbonate of lead), as being sometimes productive of pains in the abdomen, paralysis of the hands, and all the other symptoms of lead colic. Yet it is still not unfrequently employed in this country, and we are surprised to find it recommended by J. P. Frank, Mason Good, and Burns, as one of the best preparations for dusting excoriations in children. A lotion containing the sulphate of zinc, and a weak spirituous wash, are often useful applications.

The erythematous inflammation induced by pressure will generally cease on the removal of the cause. Where it occurs from lying long on the same parts, as often takes place in tedious fevers, in phthisis, and in those who are bed-ridden from other chronic disease, a change of posture, if possible, or the judicious application of pillows, so as to take the weight of the body off the prominent and inflamed points, are obvious modes of relief. Protecting the skin by chamois leather, soap-plaster, gold-beater's leaf, or white of egg coagulated by alcohol, are expedients to which we are obliged to have recourse when the posture cannot be changed. In low fevers the cutaneous vessels partake of the general debility of the system, and like other weak and irritable parts are readily excited to inflammatory action by the stimulus of pressure. Camphorated and spirituous washes seem, when early applied, to have considerable effect in hardening the skin, supporting the tone of its vessels, and enabling them to resist the influence of the above cause.

The treatment of the erythematous inflammation induced by extremes of temperature is to be found in all systematic surgical works.

The redness ensuing upon the sting of an insect is generally so transitory and trifling as not to require any medical aid. After the extraction of the sting, the application of olive oil with opium and ammonia are amongst the most effectual means of giving relief. The efficacy of ammonia is, probably, in some degree attributable to its chemical action, as the irritating fluid introduced by the sting, is generally, as Tiedemann has observed, of an acid quality. A great share of its influence is also, no doubt, ascribable to its changing the mode of the sensibility in the irritated parts.

That species of erythematous efflorescence which is brought on by the application of chemical agents to the skin, usually ceases speedily after their application has been omitted; and its disappearance may be accelerated by emollients, fomentations, and other measures, which at once tend to remove all remains of the irritating substance, and to relax and soothe the excited skin. Where the irritating matter is of a resinous nature, oily applications will greatly facilitate its removal.

When the contact of urine and fæces is the source of the evil, frequent changes of linen are indispensable; and every effort should be made to keep the parts clean and dry. The detail of the expedients which have been devised for the fulfilment of this object is to be found in such works as treat of diseases and injuries of the bladder, urethra, &c.

When erythema results from the distension of the skin by tumours of rapid growth, relaxant applications under some circumstances, and the application of leeches and cold under others, are called for; but as such cases usually fall under the care of the surgeon, we shall not dwell on them here. Where this inflammation is induced by anasarcous distension, a horizontal posture is very important, and frequent fomentations, and keeping the limbs enveloped night and day in lint moistened with water, and the whole wrapped up in oiled silk, so as to prevent too rapid evaporation, are measures which tend notably to diminish tension by keeping the skin in a relaxed and perspirable state, and which have likewise great influence in subduing local inflammation. When the inflamed surface assumes somewhat of a livid or brownish hue, and threatens gangrene, the use of dilute spirituous and camphorated fomentations is the common practice, though the propriety of it is not universally acknowledged. Those who look upon inflammation as the source of all the danger, prefer soothing applications throughout. Whilst using these local measures, we must at the same time endeavour to promote the absorption of the effused fluid, support the strength, and combat disease of the heart, lungs, serous or mucous membranes, which so often coexists in these cases, and as being the principal cause of all the other symptoms, demands our chief attention.

When the irritation of some papular, vesicular, or pustular disease seems to be the exciting cause of erythema, the latter may generally be disregarded, provided we take the proper steps for relieving the primary affection, and these will probably for the most part be found in the due employment of soothing or antiphlogistic measures. In that species which so often complicates acne, where it is constitutional, a cure need hardly ever be expected, as it seems to depend in some degree on a varicose state of the minute veins. Cold evaporating and slightly astringent lotions, with moderate but long-continued pressure, are almost the only measures which afford permanent benefit in varicose affections of the smaller veins in other parts of the body; but they are, if not wholly in applicable in this situation, at least too inconvenient to give them any chance of being steadily and long enough employed. Very great temperance, regular exercise, and avoidance of all those causes which we have pointed out as tending to exasperate this affection, should be strongly enjoined. Where the scurfiness is considerable, some mild ointment is useful in removing or concealing it. If the affection be purely local, slightly astringent lotions of lead or zinc, with a small portion of alcohol or vinegar, may be tried, or ointments of a similar nature; but they will too often prove nugatory in their effects. The popular use of water-cresses and other raw vegetable matter, under the name of antiscorbutics, is highly irrational. A somewhat tonic regimen, and the use of flesh meat in preference to an exclusively vegetable diet, are proper. We have lately met with a striking exemplification of this in the case of a distinguished artist, in whom this affection, induced by the habitual stooping which the exercise of his profession required, was greatly and suddenly aggravated by a strict adherence to a vegetable diet, and again diminished considerably on his returning to the free use of flesh meat. The distension and acidity of stomach which an excess of vegetable food often induces, assist us in explaining its injurious effects in such cases. Where the eruption depends upon some chronic derangement of the digestive organs and an irritable state of the stomach, little can be expected from topical applications. Stimulants (and most of the empirical lotions for this affection contain corrosive sublimate, and are of this nature,) are usually injurious, and to remove this efflorescence by astringents, where possible, might do much mischief, by exasperating the internal disorders from which they spring. Alkalies internally seem sometimes useful, which is attributable, probably, to their antacid power, and their directly soothing effects on the mucous membrane. The regulation of the functions of the stomach, bowels, and liver, with a careful attention to the diet, are the most important points in endeavouring to prevent its increase.

The redness of the skin which is occasionally induced by inflamed ulcers, leech-bites, painful issues, &c., in addition to such internal antiphlogistic means as the existing state of the system may appear to indicate, requires locally merely the application of a bread-and-water poultice, or of lint, moistened with cold water and enveloped, as directed above, in oiled silk, to prevent its drying rapidly by evaporation. The erythematic inflammation succeeding to the use of leeches seems often to be induced, not so much by the irritation of the wounds they inflict, as by that excited in them by the subsequent application of Goulard and other astringent tonics. Where it is necessary to apply cold to a part immediately after leeches have fallen off, by confining ourselves simply to the use of cold water, in preference to these medicated lotions, we shall rarely have the mortification of seeing this cutaneous affection, which is often very annoying to the patient and his attendant, ensue; whilst, at the same time, the temperature may, by means of the coldness of the water and its gradual evaporation, be regulated quite as effectually.

SYMPTOMATIC ERYTHEMA is associated with many inflammatory affections, especially those of the mucous membrane of the stomach and intestines; and the symptoms which have been by some attributed to the cutaneous affection are really, as well as itself, dependent on the state of the internal organs. The measly efflorescence so common in our continued fevers of some years, is a striking example of the sympathy of the cutaneous system with the mucous membrane. In dysentery, too, exanthematous efflorescences occasionally occur, and sometimes, according to Chomel, form a salutary crisis to the disease.

The erythema of Willan and Bateman, of which we have already given the definition, nearly coincides with Rayer's erythema symptomaticum, and has been divided into six varieties. In some of these the eruption is more or less elevated at some period of the course, thus slightly approximating them to the papular and tubercular classes; but these elevations are obscure and soon subside. Willan has, however, availed himself of their temporary existence to form the groundwork of some of his subdivisions.

1. **Erythema fugax** (maculæ volaticæ) consists of evanescent red patches of an irregular figure, which appear successively on the breast, neck, arms, and face, in various febrile disorders, in bilious diarrhœa, in chronic affections of the primæ viæ, dyspepsia, hysteria, &c. The heat of the affected skin is increased, and the disappearance of the patches is not accompanied with any evident desquamation.

2. **Erythema læve** of Bateman coincides almost, if not altogether, with the species which we have already described as depending on dropsical distension. He dwells on the usual coexistence of anasarca, on the smooth shining surface, its appearance chiefly on the lower extremities, and its termination in desquamation, and says it may occur either in sedentary young persons, in whom exercise, diuretics, and corroborants will contribute to shorten its duration, or also in elderly or anasarcous subjects, especially if intemperate, and is liable to terminate in gangrenous ulcers. The distended skin is often chequered with patches of a dark red or purple hue. Horizontal posture, diuretics and bark, with weak spirituous lotions, are recommended by him. He adds, that it sometimes occurs without œdema where the bowels have been much disordered, and occasionally is worse at the menstrual period.

3. **Erythema marginatum** occurs chiefly in old people on the loins and extremities in the form of patches, which are in some places obscurely papulated, and are bounded on one side by a hard, elevated, tortuous, red border, but are not regularly defined on their open side. They have an uncertain duration, and are not productive of any irritation in the skin. They are connected with some internal disorder, and are usually an unfavourable symptom.

4. **Erythema papulatum** consists of large, vivid, red, irregular patches, chiefly on the arms, neck, and breast, generally preceded for a day or two by obscure papulæ, which give a roughness to the skin. The eruption, after continuing about a fortnight, becomes bluish, especially in the centre of the patches, and gradually declines. There

is occasionally, though not always, considerable constitutional disturbance, indicated by a small, frequent pulse, anorexia, and great depression, with severe pain and tenderness of the limbs. The treatment consists in light diet, diaphoretics, the mineral acids, and attention to the state of the bowels.

5. **Erythema tuberculatum** occurs, like the preceding, in large, irregular, red patches, but through these small tumours are dispersed, subsiding in about a week, and leaving the erythema behind them, which, becoming livid, disappears in about a week more. It is usually ushered in by fever, and is accompanied with languor, irritability, and restlessness, and is succeeded by hectic. It is so rare, that Bateman himself never saw it, and Dr. Willan, on whose authority he gives it, met with but three cases, and medicine seemed to have no effect either in alleviating them or in warding off the subsequent hectic.

6. **Erythema nodosum** seems peculiar to females, and occurs chiefly about the shins. It is preceded by slight febrile symptoms, which cease on its appearance. It presents itself in the form of oval patches, with their long axis parallel to the shin bone. They rise slowly into hard and painful protuberances, which gradually subside within nine or ten days, their colour about the same time turning bluish. It is a mild affection, requiring usually only laxatives, mineral acids, and other tonics. We have known it, however, return frequently in the same individual, attended with considerable œdema, and after terminating in desquamation, succeeded by severe pains in the limbs, which demanded the employment of pediluvia, bandages, &c.

To these six varieties mentioned by Willan and Bateman, we give a seventh, *general erythema*, on the authority of Rayer, who says it has been overlooked by most writers on cutaneous diseases, or confounded by them with erysipelas. It consists in a superficial redness of the skin unequally distributed over various parts of the body, and occasionally differing but slightly from the natural colour of the integuments, and unaccompanied by swelling or vesications. It is attended with heat and dryness of the surface, and its duration rarely exceeds a week. The redness may be continued or intermittent, or appear only momentarily, during the exacerbation of gastro-enteritic or other acute internal inflammations. It often disappears on the approach of death. In those who recover, desquamation and falling out of the hair one or two weeks after the disappearance of the eruption, often occur.

This species, and, indeed, all cases where the erythema presents itself in an acute form, require antiphlogistic regimen, and occasionally venesection, with cooling and emollient lotions, and the tepid bath.

In the chronic varieties of erythema, Rayer recommends leeches to be applied round the affected parts, together with tepid and vapour baths, or the douche impregnated with sulphuretted hydrogen. Where the cutaneous inflammation depends on some evident derangement in the stomach or intestines, the application of leeches in the neighbourhood of these organs may also be necessary.

W. B. JOY.

[EUTROPHIC; from ευ, "well," and τροφη "nourishment:" that which is capable of inducing improved nutrition. A term introduced by the writer into medical terminology, to include agents whose action is excited on the system of nutrition, without necessarily occasioning manifest increase in any of the secretions. In this wide sense, it is almost synonymous with ALTERATIVE (q. v.) The term alterative has, however, been used most indefinitely. Every remedial agent must, indeed, modify or alter, directly or indirectly, one or more of the functions; and, therefore, must be regarded as an alterative. Tonics induce this effect by the impression they make on the nervous system; DIRECT EUTROPHICS, in the sense employed by the author, by modifying the fluid of the circulation, so that, when it permeates the intermediate system of vessels, it may impress them differently, and thus *alter* morbid actions that may be taking place in them. There are but two ways, perhaps, in which alteratives can exert their agency on the system: the one is through the new impression they make directly on the nerves; the other, through the way of absorption. Tonics, it is probable, act in the former mode; eutrophics,—which occasion the absorption of solid parts of the body, —most substances, indeed, which impress new activity on the capillary system—generally in the latter.

There are agents, however, which modify nutrition indirectly,—not by any change, which they effect in the fluid of the circulation, and which may, therefore, be called INDIRECT EUTROPHICS; the various alterative agencies, for example, referred to under another head. (See ALTERATIVES.) The influence of the nervous system as a modifier of nutritive action is strongly exemplified, when powerful impressions are made upon it. Of this we have examples in the effect of the imagination, or of new impressions on the nerves, in discussing tumours of various kinds. Some of these growths are possessed of little vitality; and if the nervous and vascular influence be detracted from them, they speedily die. This is the way in which charms remove warts. It is a common, popular superstition, that a dead man's hand, rubbed on a wen or an enlarged gland, may dispel it; and such is the occasional result: in the same manner Perkinism, touching for the king's evil, &c. &c., become sorbefacient agencies. It appears, consequently, that any thing of a physical or moral nature, which concentrates the vital activity on any part of the organism, may diminish the amount of nutritive exhalation in another part, and at the same time modify the function of absorption; and that under this change in nutrition, parts may be reduced in bulk, morbid tumours disappear, and dropsical accumulations be absorbed. In this mode, *methodical compression* and *friction* operate as valuable sorbefacient or eutrophic agencies.

In eutrophics, as a class, is comprised a number of valuable remedial agents, that may be adapted for various conditions of disease, which, as in the case of different cachexies, may have resisted other modes of management. Of these, one of the most important is *mercury*, in its various forms of preparation. The precise nature of its action on the economy has been a matter of dispute. It certainly passes into the mass of blood, and doubtless, like eutrophics in general, modifies the condition of that fluid, so as to exert dynamically a new action on secretion and nutrition; but as to the precise mode in which this is accomplished, we knew no more than we do of the *modus operandi* of other articles of the class, or, indeed, of any of the classes of therapeutical agents. It is impossible to depict every case in which this valuable agent is capable of affording benefit. It seems to be adapted for all cases in which it is desirable to induce a change in associated actions, and hence is an invaluable revellent in many febrile and inflammatory affections. As a eutrophic, it is chiefly indicated in chronic affections, that are characterized by morbid depositions, or hypertrophies.

The preparations of iodine are, likewise, admirable eutrophics; well adapted for cases in which it is desirable to modify the state of the fluid of the circulation. Hence, they are much used in the various cachexiæ, and for the removal of different morbid growths. The reputation of iodine is most decided in goître. In scrophulosis it has attained great celebrity; and in certain of the constitutional forms of syphilis has supplanted mercury.

Burnt sponge, cod-liver oil, animal charcoal, chloride of calcium, chloride of barium; the preparations of arsenic, of gold, and of silver, of platinum and of iron; as well as alkalies, and the mineral acids; chlorine and chlorinated preparations; sulphur; the free internal use of sugar: sarsaparilla; guaiacum-wood; mezereon; the root of aralia nudicaulis; bark of sassafras root; dulcamara, &c., are the chief eutrophics now used. For the precise cases to which they are respectively adapted, and for the forms of preparation of these and other eutrophics that are most advisable, the reader is referred to another work—(*General Therapeutics and Mat. Med.* ii. 290, Philad. 1843.)

ROBLEY DUNGLISON.]

EXANTHEMATA.—The word exanthemata, derived from the Greek term ἐξανθέω, to *effloresce*, or *break forth*, was applied, by the Greek writers, to cutaneous eruptions generally. By modern authors its application is confined to cutaneous eruptions accompanied with fever, arising from specific contagion.

In the nosology of Cullen, the exanthemata constitute the third order of the class Pyrexiæ, and we find he has included ten different genera, viz. *variola, varicella, rubeola, scarlatina, pestis, erysipelas, miliaria, urticaria, pemphigus*, and *aphthæ*. It is evident, however, he has included not only the eruptive fevers, strictly so called, but those diseases in which a vesicular efflorescence occasionally appears in their progress. Plenck, Frank, and others have fallen into a similar error. Willan and Bateman classify the exanthemata, according as the eruption agrees with their definition of an exanthema or rash, viz. "superficial red patches, variously figured and diffused irregularly over the body, leaving interstices of a natural colour, and terminating in desquamation of the cuticle." They therefore comprehend, under exanthemata, *rubeola, scarlatina, urticaria, roseola, purpura*, and *erythema*.

In the article FEVER will be found the classification of fevers we propose to adopt in this work, viz. into 1. *continued*; 2. *periodic*; and 3. *eruptive*. The eruptive fevers comprehend those diseases which we submit should alone be included in the exanthemata, viz. *variola* (and its modifications), *rubeola*, and *scarlatina*. In those diseases which bear a strong analogy to continued fever, we find that a certain order of febrile symptoms is followed by a particular eruption; that the fever and exantheme run a definite course; the efflorescence going through a regular series of changes, and terminating in desquamation of the cuticle; that these eruptive fevers occur only once during the life of the individual; and lastly, that they are communicated by contagion.

The regularity of the eruptive fever and the progress of the efflorescence are most precise. The eruption of *small-pox* appears on the third day from the commencement of the febrile indisposition, and maturates on the tenth; the rash of *measles* appears on the fourth, and declines on the seventh day; and the efflorescence of *scarlatina* is visible on the second day, and begins to disappear on the fifth; the progress of the fever being thus fixed and regular, and apparently keeping pace with the series of changes which the eruption successively undergoes.

The circumstance that eruptive fevers occur only once in the course of life, though correct as a general rule, is liable to occasional exceptions. These, however, are comparatively so few, that they tend much to confirm this principle. Persons, on the other hand, occasionally escape one or more of the eruptive fevers; more frequently, however, scarlatina than either small-pox or measles.

The last characteristic of the exanthemata — that they are communicable by contagion — admits of positive proof as to small-pox, in the communication of this disease by inoculation.

Dr. Home (Clinical Experiments) succeeded in communicating measles by introducing the blood of a patient affected with the disease into the system of another individual; and the evidence of the contagious nature of scarlet fever is so strong that no one in the present day ventures to impugn the doctrine. (See MEASLES, SCARLATINA, SMALL-POX, and VARICELLA.)

A. TWEEDIE.

EXPECTORANTS, (from *ex* and *pectus*; *expectoro, expectorans, Expectorantia*,) are medicines intended to promote the exertion of mucus and other substances from the trachea, its branches, and the bronchial cells. In offering this definition, it is proper to mention that the existence of any substances capable of unloading the pulmonary tubes has been doubted; but experience has demonstrated that not only substances applied in the form of vapour or of gas to the parts now mentioned, promote expectoration, but that substances taken into the stomach produce the same effect.

The mucous membrane of the air-tubes of the lungs is the part intended to be influenced by expectorants. This membrane, which lines the whole of these tubes, from their origin, through their trunk, the trachea, and all its ramifications, to their termination in the bronchial cells, secretes a lubricating bland mucus, in appearance not unlike a thin solution of gum, intended to mitigate the action of the air on a highly irritable surface. When this mucus is accumulated, or becomes viscid and adheres to the sides of the bronchial tubes, or when it is inspissated or rendered acrid by inflammation excited in the membrane, so as to impede in any manner the function of respiration, then expectorants become useful by contributing to its removal. In effecting this, they operate in two distinct ways; 1. they either diminish the action which has produced the preternatural secretion, and thereby enable the natural effort of coughing to remove the morbid matter already existing in the air-tubes, or, 2. they directly operate on the respiratory nerves, and powerfully excite those muscles, the sudden simultaneous action of which is necessary for expelling the morbid matter. It is easy to conceive in what manner gaseous substances introduced into the lungs may promote this expectorant effort; but the question naturally suggests itself, do the substances taken into the stomach proceed to the lungs, and there exert their influence?

Many substances, when introduced into the system through the stomach, escape by the lungs. Thus, various odorous matters, oil of turpentine, ether, alcohol, phosphorus, and camphor, soon after they are taken into the stomach, become perceptible in the breath; and this is the case, also, when they are introduced into the system by other channels. M. Breschet and Dr. Edwards having injected oil of turpentine, in small quantity, into the crural vein of a dog, found that it was soon afterwards strongly exhaled from the lungs, although no odour of it was perceived on exposing the peritoneum.[*] From these and other facts it is evident that the lungs afford exit to substances which have entered the circulation: now, in admitting this, it is not unreasonable to suppose that some of the medicines administered with the intention of promoting expectoration also enter the circulation, and proceeding to the lungs, excite there the expectorant effort. But, although this conclusion be highly probable, yet it must be admitted that it is not susceptible of demonstration.

All expectorant substances may be arranged under two heads.—1. Those which effect the excretion by *topical* means; 2. those which effect it by *general* means.

1. **Topical Expectorants.**—These may operate in two ways: *a.* they may directly stimulate the nerves regulating the action of the respiratory muscles, and, by exciting these to sudden action, may effect the excretion by coughing; or, *b.* they may compress the thoracic viscera by producing vomiting, and thus induce a sudden and forcible expiratory effort so as to effect the expulsion of matters from the lungs.

a. In explaining the manner in which the first kind of topical expectorants operate, it may be useful to consider briefly the nature of coughing. The act of coughing is a short and forcible expiratory effort, frequently repeated, the inspirations, in the intervals, being trifling in comparison with the expirations. Any irritation affecting the glottis, and acting upon a branch of that series of nerves which supply the respiratory muscles, excites involuntary coughing; but the action thus excited may be moderated, if it cannot be wholly checked and terminated, by the will of the individual. Coughing, whether voluntary or involuntary, is the result of the irritation of a certain set of nerves, and is intended to relieve the bronchial system of some offending cause; it is, therefore, a salutary phenomenon. In those debilitated by disease or other causes, the difficulty of exciting the act of coughing with force sufficient to produce the salutary effect, is so obvious as to strike the ordinary as well as the professional observer. The distress arising from this circumstance, the uneasiness caused by the irritating matters which coughing forcibly would readily remove, and the feeling of suffocation experienced from the accumulation of mucus obstructing the free passage of the air to the bronchial cells, are very considerable. In such states of the chest, the topical application of a stimulant to the bronchial nerves may so far rouse the exhausted excitability as to enable the muscles to perform the necessary effort; whilst, at the same time, the substances employed to produce this effect may be of a nature to prove also beneficial, by imparting a renewed healthy action to the diseased mucous membrane. The whole of the substances arranged under this head, it must be recollected, stimulate so much as to require the utmost caution in their administration; but as the atmospherical air is the vehicle by which they are conveyed into the lungs, there is no difficulty in apportioning the degree of dilution so as to regulate the quantity of stimulus required or admissible.

The substances employed for the purpose of stimulating the mucous membrane of the bronchial system by direct application, and through it stimulating the respiratory organs, are few, and of these a small proportion only are in use.

Benzoic acid may be employed either in its separate pure form or at the instant of its extrication from benzoin. In either case it requires to be largely diluted with atmospherical air, and combined with aqueous vapour. If the crystallized acid be employed, half a drachm should be put into an inhaler, and volatilized by the heat of a spirit-lamp; or if the crude benzoin be preferred, half an ounce of it should be broken into small morsels and treated in the same manner. In the first instance, the diluted acid is the stimulating agent; in the second, the volatile oil, mixed with a small portion of the acid, rises with the aqueous vapour. Both are said to have proved beneficial in phthisis, even after the existence of suppurating tubercles had been clearly ascertained. The writer of this article has never employed these stimulants in phthisis; but he has seen much advantage derived from them in spasmodic asthma, in shortening the paroxysm and promoting expectoration.

Acetic acid acts nearly in the same manner as the benzoic. It is the oldest of the topical remedies of this order, is more manageable than the acid of benzoin, and does not require the aid of boiling water for its elevation. It is usually extricated from diluted vinegar; but as this contains sulphurous acid, distilled vinegar should be employed.

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[*] During this experiment, if a portion of the surface was denuded and a cupping-glass applied over it, the odour was not then perceptible in the breath.

Chlorine is of very late introduction as a topical expectorant. It may be breathed by mixing it with the common air of the apartment of the patient, at the moment of its extrication from chloride of lime or of soda; or from a mixture of one part of peroxide of manganese and four parts of muriatic acid.* The former is to be preferred when a moderate stimulus only is required; but in general, for expectorant purposes, chlorine is obtained by expelling it from its saturated solution in water by the aid of gentle heat.

If an attempt be made to breathe chlorine in its undiluted state, it does not enter the lungs, but produces a powerful spasm of the glottis; and, if this be not immediately relaxed, suffocation ensues. When it is diluted with a moderate portion of air, it excites violent coughing, irritation in the bronchial cells, great dyspnœa, and a painful, anxious sensation in the chest, which continues for several days. When largely diluted it operates as a salutary stimulus to the mucous membrane.

In its largely diluted state, chlorine gas was first proposed as a topical expectorant by Dr. Favart of Marseilles in 1804. Soon after that period the writer of this article became accidentally acquainted with its value as a topical expectorant, from witnessing its beneficial influence in a severe case of epidemic catarrh, when extricated as a fumigation to check infection; and he has employed it occasionally from that time in pulmonary diseases. But it was scarcely used either in this country or on the continent, until a report of Dr. Cottereau, of the Faculty of Medicine of Paris, again brought it before the profession. Several trading chemists, in particular M. Gannal, had remarked that phthisical persons, who engaged themselves to work in the manufactories of bleaching liquor, in which chlorine is largely extricated, were gradually but evidently improved in health: to confirm his observations, M. Gannal constructed an instrument for inhaling it, and actually administered it as a remedy in phthisis. The success of his experiment surprised him; but not being a medical man, he mentioned his views of the subject to Dr. Cottereau, who pursued the same plans as M. Gannal, and with a degree of success sufficient to merit the attention of the profession. The same influence of chlorine in pulmonary diseases has been observed by Mr. Tenant, of Glasgow, who informs us that all the men who engage themselves to work in his manufactory, if they have coughs, are rapidly relieved when gradually introduced into the chlorine house; and of late, people labouring under phthisis and asthma have taken lodgings in the neighbourhood of his works, for the sake of the atmosphere of chlorine emanating from them.

[Farther experience has not, however, confirmed these favourable reports, and some writers of distinction have regarded it to be prejudicial in phthisis. (See the writer's *New Remedies*, 4th edit. p. 151, Philad. 1843.) In all cases it has to be employed carefully and experimentally; but no marked benefit can be expected from it in phthisis. It can only be adapted for cases of disease in which the pathological condition of the bronchial mucous membrane, or neighbouring parts, requires the exhibition of an excitant. In this way, it may be occasionally serviceable in chronic bronchitis.]

The best method of inhaling chlorine is to put f.ʒi or f.ʒii of the saturated aqueous solution into a glass inhaler, and add to it f.℥ii of hot water, which gradually drives off the chlorine. This quantity may be inhaled every five or six hours, so as to maintain the effect produced on the mucous membrane.

[A convenient apparatus for the inhalation of chlorine, iodine, &c. has been prepared by Dr. Corrigan of Dublin. It is figured in the writer's *New Remedies*, loc. cit., and in his *General Therapeutics & Mat. Med.* i. 253, Philad. 1843.]

When it is thus cautiously inhaled, the evident effects are a slight sensation of constriction in the thorax, with some increase of cough; in a few instances a trifling degree of vertigo has been experienced, but these feelings rapidly subside; expectoration is produced almost without an effort, and the patient gradually becomes more comfortable than before inhaling the gas. In cases of asthma the relief is peculiarly striking; and in phthisis we have observed that the symptoms of hectic have much abated during its employment: but we have seen no instance of the latter disease cured by it.

The beneficial operation of chlorine may depend on its stimulus producing a new action on the diseased surface, which, if it could be maintained for a sufficient length of time, might overcome the morbid action; and by supporting the tone of the system by other means, without exciting fever, the disease might be cured. In cases where large vomicæ exist, it is in vain to expect a cure from any means; but if we reflect on the influence of chlorine in improving the discharge from diseased mucous surfaces, such as that of the nostrils in coryza, and in promoting the cure of external ulceration, it is not a vain speculation to expect much advantage from its inhalation in phthisis.

When chlorine is inhaled without being sufficiently diluted, the irritating effects are only temporary: very few instances have occurred in which inflammation has supervened. Indeed to no other irritant gas does the pulmonary system so rapidly accommodate itself; the workmen in the manufactories of bleaching liquor breathe it daily in large quantities with impunity. The best method of overcoming its deleterious effects is to inhale ammonia largely diluted with aqueous vapour or ether; or, if neither of these be at hand, to inhale simple warm vapour.

[The inhalation of *iodine* has been recommended as an excitant topical expectorant in the same diseases as that of chlorine. It has been strongly advised in phthisical affections. Sir C. Scudamore (*Lond. Med. Gaz.* Feb. 17, 1838, and Feb. 7, 1840) found the addition of a little tincture of conium beneficial in subduing the irritating qualities of the gas. The writer—as elsewhere remarked—has often used the iodine inhalations in phthisis, but his experience has not been favourable to it, and the same view has been entertained by others. (Pereira, *Elements Materia Medica*, 2d edit. i. 295, Lond. 1842.) It would seem to be better adapted for chronic bronchitis.]

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* In this process the muriatic acid, which is a compound of hydrogen and chlorine, is partially decomposed; and decomposition of the peroxide of manganese also takes place. The liberated hydrogen of the muriatic acid unites with one equivalent of the oxygen of the peroxide of manganese, and forms water; whilst the chlorine is set free in a gaseous state. This gas is of a greenish yellow colour, and has a pungent, acrid, suffocating odour. It is really absorbed by water; but the solution, unless kept in a blackened bottle or a dark place, is changed in its character by slow decomposition of the water and the formation of chloric and muriatic acids. Its goodness is known by testing it with litmus paper: if good, it will destroy the colour of the paper; if it contain the above-mentioned acids, the paper will be reddened.

The substances which operate topically, either by stimulating the pulmonary exhalents, or as sedatives relieving the constriction on these vessels, and thereby facilitating expectoration, are also few. In those unaccustomed to the use of the former, they undoubtedly excite coughing; but in such cases the spasmodic action is produced by their first impression on the glottis, for when they are admitted into the trachea, no coughing is produced. The first of these, the fumes of boiling *tar*, was recommended as a remedy in phthisis by Sir Alexander Crichton, who had seen it employed in Russia. It produces in general much increase of cough; but this soon abates, and the expectorated matter is, in most instances, much improved. These effects seemed to promise the most salutary results; but like some other remedies which have been occasionally introduced to the notice of the profession, the vapour of tar suffered from being overpraised, and from too sanguine expectations being formed relative to its powers, and it fell into neglect.

[*Creasote*, like tar vapour, has been occasionally inhaled in the same pulmonary affections; five, ten, or fifteen drops, according to the degree of tolerance of the lungs, being dropped into hot water in an appropriate vessel, and the vapour being inhaled through the tube of an inverted funnel, or by means of any of the inhalers in use.]

Another vapour which operates nearly in the same manner as that of tar has been much employed in America, the *fumes arising from burning undressed wool.* The use of these vapours was first recommended by Dr. Physick, who had found them extremely serviceable for stimulating and healing external sores, and concluded that they might prove equally beneficial if inhaled into the lungs. He conceived that he had established the fact of their utility in phthisis; but the experience of a few instances in which they were tried by the writer of this article does not authorize him to pronounce very favourably respecting their employment. They excited great coughing when they were first used; but this rapidly subsided, and some degree of comfort was certainly experienced after each time of inhaling them; but nothing more resulted from their employment.

The sedative topical expectorants are better known. *Tobacco*, when smoked, has been long employed for allaying the violence of the paroxysm in spasmodic asthma; but it is uncertain whether the benefit should be ascribed to the nicotina or the volatile oil. The use of *stramonium*, in the form of smoke also, has been found highly useful, and was at one time a favourite remedy in asthma. It appears to produce its beneficial effect in two ways. In the first place, it is directly applied to the mucous membrane when this is in a state of great irritability, and by acting as a sedative and allaying this condition, it favours the slower and more perfect secretion of the mucus, which being thus brought into a more natural state, is consequently more easily excreted: in the second place, by influencing generally the nervous system, the spasmodic symptoms attendant on the paroxysm of asthma are allayed, and respiration proceeds in a calm and undisturbed manner. The powers of stramonium were, at one time, greatly overrated; but experience has sufficiently demonstrated that it is capable of mitigating the violence of the paroxysms, although it may not be able to establish permanent relief from their attacks. Dr. Bree has objected to the employment of stramonium on the supposition that it induces a tendency to apoplexy; but this is, at best, problematical.

b. The second set of topical expectorants, those which operate by mechanically compressing the thoracic viscera, and thus induce a sudden and forcible expiratory effort, so as to affect the expulsion of matters from the lungs, are emetic substances. In the operation of vomiting, by the sudden and violent contraction of the abdominal muscles, in order to force the contents of the stomach upwards, an impulse is communicated to the whole bronchial system, and by this means the expiratory effort being rendered more forcible, the expulsion of the mucus is effected. The beneficial effect of emetics in clearing away mucus accumulations from the lungs is indeed well known; and frequent recourse is had to them in many of the pulmonary diseases of children with uniform advantage. It might be supposed that the best emetics to select for expectorant purposes, would be those which operate by directly stimulating the nerves of the stomach, and which call the muscles necessary in the mechanism of vomiting into immediate action; but experience has demonstrated that the antimonial preparations are better suited for this purpose than any other emetics. Besides aiding the expulsion of mucus from the bronchial tubes, they possess the power also of controlling inflammatory action. The employment of emetics for procuring expectoration was formerly in much vogue as a remedy in phthisis. The emetics for this purpose, however, were seldom selected upon any principle: at one time we find sulphate of zinc and sulphate of copper employed; at another, antimonials, ipecacuanha, and other nauseating emetics. If the lungs be loaded with mucus, and little or no febrile action be present, the direct emetics are to be preferred; for in this case the mechanical impulse only is required; but if, in promoting expectoration, we are desirous of maintaining nausea afterwards, then the best emetic is the vinous solution of the tartrate of antimony and potassa, given to the extent of f.ʒvi for a dose, in a solution of the extract of liquorice. Squill and sulphuret of potassa have also been employed to excite vomiting to aid their expectorant properties.

2. **General Expectorants.**—These operate either by being received into the circulation, or through sympathy with the stomach: the first

stimulate the pulmonary exhalents through the medium of the circulation; the second affect the excretories by the nausea which they induce.

a. The first of the *organic* substances which operate by stimulating the pulmonary exhalents is *emetina*, the active principle of ipecacuanha. In its uncombined state it has not been much employed in Britain; but in France it has been successfully administered in doses of one-eighth of a grain, three or four times a day, in hooping-cough; and in doses of a quarter of a grain it proves useful in catarrhal affections. It produces expectoration without exciting nausea; and we can readily comprehend how this is effected, if we admit that it is received into the circulation and determined to the lung as its emunctory: but if this be not admitted, it is difficult to explain its mode of acting:—its beneficial influence is undoubted. When ipecacuanha itself is administered, it is usefully combined with opium, in the form of Dover's powder, of which from three to five grains produce expectorant effects, when neither nausea nor diaphoresis result. The French physicians assert that ipecacuanha is less useful in pulmonary diseases than uncombined emetina, owing to a peculiar fatty matter which it contains interfering with the influence of the emetina. This opinion is merely hypothetical; but nevertheless the evidence which experience has afforded in favour of the expectorant power of emetina is sufficient to recommend it to the favourable notice of British practitioners.

The value of *squill* as an expectorant has been long known: it is supposed to depend on a peculiar principle which has been named scillitina. If this opinion be correct, it is probable that the squill undergoes decomposition in the stomach, and that the scillitina only is conveyed to the lungs. This opinion, however, is as yet unsupported by proof; and much obscurity still involves the mode in which squill produces its expectorant effect. Squill is contra-indicated in all diseases of an inflammatory type. It is usually administered in combination with honey and vinegar in the form of an oxymel, or in tincture, or as a pill in combination with soap and ammoniacum. In these forms it is prescribed with advantage in asthma and chronic catarrh. The dose should not exceed one grain of the dried bulb, as in larger doses it is apt to prove emetic, purgative, or diuretic: one drachm of the oxymel, seven grains of the pill, and thirty minims of the tincture, are equivalent to this quantity of the dried bulb. When over-dosed, squill excites the most violent vomiting, purging, and convulsions, symptoms which induced Orfila to refer its operation to the nervous system; an opinion partly confirmed by the fact that dissections of persons poisoned by squill present no appearances of inflammatory action in the pulmonary system. The best antidotes are ammonia and the alkalies, on which account these substances are incompatible in prescriptions with squill.

Several of the gum resins are generally regarded as useful expectorants, but the expectorant property of some of them is doubtful. *Myrrh* is one of these, and assuredly we have never seen it produce expectoration when given alone: conjoined with ipecacuanha or squill, it proves useful in the chronic coughs and catarrhal affections of debilitated habits; but in these cases more is due to its tonic than its expectorant influence. It is frequently prescribed with the view of supporting the system in the advanced stages of phthisis; and, probably, no medicine is better adapted for this purpose during a course of the inhalation of chlorine. At best, however, it can only be regarded as an auxiliary. In prescribing myrrh, it should be recollected that its aqueous infusion precipitates salts of lead, which are, consequently, incompatible in mixtures with it. In phthisis it is advantageously combined with sulphate of zinc or salts of iron; and when there is much acidity of stomach, it may be dissolved in liquor potassæ or ammoniæ, and administered in any bland fluid or aqueous solution, such, for instance, as the bitter almond emulsion. Its efficacy as an auxiliary is well established in chronic catarrh and humoral asthma, in both of which diseases its tonic influence is beneficial in relieving the exhaustion which follows the profuse expectoration. The dose of myrrh, in such cases, is from four to ten grains, repeated every third or fourth hour.

As an expectorant, *ammoniacum* has been found useful in asthma, peripneumonia notha, and the chronic catarrh of old age; it has also been prescribed in tubercular phthisis. It is seldom given alone, but usually in combination with squill or antimonials. In America it has lately been conjoined with nitric acid: two drachms of it are triturated with f.ʒii of nitric acid, and then formed into an emulsion with f.℥viii of water. A tablespoonful of this solution in a cupful of any bland fluid is administered every second or third hour, in cases of old catarrhs, when there is an infarction of the lungs with viscid mucus, which the patient has not strength to expectorate. It may in this state certainly rouse the energy of the respiratory muscles; but we doubt whether it is equal to ammonia or its carbonate in such cases. It may, however, be administered in conjunction with ammonia; and, when thus combined, no other expectorant produces so much benefit in those irritable coughs which accompany hysterical affections, and are attendant on dyspeptic and hypochondriacal conditions: the expectoration becomes freer and more abundant, the oppression diminishes, and the patient is rendered altogether more comfortable. Ammoniacum, Galen informs us, was employed by Crito as an expectorant in phthisis; it formed the chief ingredient of the pilulæ balsamicæ of Morton, which held at one time a high reputation; and many other writers have recommended it in this merciless disease. It may prove useful in promoting expectoration where it is deficient, and may have a tendency to allay irritation; but the experience of modern practitioners has not confirmed the encomiums of their predecessors with respect to its value as a remedy in phthisis. The dose of ammoniacum, in these cases, is from eight to ten grains, administered three or four times a day. In large doses it causes nausea, thirst, and a sensation of heat at the stomach. The emulsion is the best form of administering ammoniacum as an expectorant; but as the gummy matter is not sufficient to suspend the resin for any length of time, it should be combined with mucilage. The dose of the mixture is from f.℥ss to f.℥i: it is coagulated by the oxymels, and cannot be combined with spirit of nitrous ether.

Assafœtida was regarded by Cullen as superior to ammoniacum in spasmodic asthma; and in phthisical cases, when there is much flatulency, Dr. Parr considers it valuable as combining cardiac and expectorant properties. It possesses, however, no advantages over ammoniacum, and is more heating: indeed, what has been said of ammoniacum applies equally to it, galbanum, and sagapenum: they are all stimulant expectorants, and may be administered, under similar circumstances, in the same doses and in the same manner.

The balsams employed as expectorants are those of *tolu* and *peru*, *styrax*, and *benzoin*. All of them were formerly much used in affections of the chest, whether recent or chronic; but there can be only one opinion respecting the impropriety of administering balsams in inflammatory states of the lungs. Independently of the benzoic acid which they all contain, and which is powerfully stimulant, the volatile oil, which is another of their components, contra-indicates their administration in cases of excitement. Dr. Fothergill denounces the employment of balsams in pulmonary diseases at any period of the attacks, but he carried his objections too far; and there is sufficient evidence to prove, that after the excitement is subdued, there are circumstances which not only admit of the administration of balsams, but in which they have been found highly beneficial. They are best administered in the form of emulsion, made by triturating the tincture of the balsam with mucilage of acacia gum, which renders it miscible with water; and in this form they may be usefully combined with ipecacuanha and preparations of opium. *Copaiba*, which is improperly regarded as a balsam, may be exhibited under similar circumstances. It is probable that it acts on the mucous membrane of the bronchial tubes, in nearly the same manner as on that of the urethra in gonorrhœa, by entering the circulation, and exciting a new action on the irritated surface. It is only by admitting that it operates in this manner, that we can account for the benefit which frequently results from its administration in the advanced stages of phthisis.

Among the plants yielding bitter extractive in combination with mucus and fecula, employed as expectorants, we find marrubium *vulgare*, tussilago *farfara*, and certraria *Islandica*. If the first of these, the horehound, was too much vaunted by the ancients, its expectorant properties have been unaccountably neglected by modern British practitioners. It possesses stimulant powers, alters the state of the bronchial secretion, and seems to impress a new action on the diseased surface; besides promoting expectoration, it diminishes the oppression of the chest, relieves dyspnœa, and improves the digestive function. We have seen much advantage result from its employment in humoral asthma, accompanied with great oppression, and when the sputa was tough, ropy, difficult to be expelled, and causing pain in the expectoration. Many authors, as well as Tralles, have recommended marrubium in phthisis. Although we have had no reason to place any reliance on its powers in tubercular consumption, yet we have witnessed much benefit produced by it in that variety of the disease which has been named catarrhal, in which there is much cough, with copious excretion of mucus; a diurnal fever recurring twice a day, nocturnal sweats, and great prostration of strength. In this state the combination of the expectorant and tonic powers found in marrabium have proved highly beneficial. The dried plant may be administered in the form of powder, mixed with syrup of white poppies, or in the form of an aqueous or a vinous infusion. The aqueous infusion may be made with ℥i of the dried plant and a pint of boiling water; the dose is f.℥ii, given three or four times a day.

Tussilago farfara, coltsfoot, has been as much neglected as horehound by the moderns, although it held the first rank as a pectoral among the ancients: indeed its name (tussilago is a compound of *tussis* and *ago*) speaks the estimation in which it was formerly held. Although it has not deserved the praise bestowed upon it by the ancients, yet tussilago possesses expectorant properties by no means contemptible. As a gentle tonic expectorant, the writer of this article can bear ample testimony to its influence in the sequel of hooping-cough, when the habit is greatly weakened and the cough continues; and he has seen it equally beneficial in many cases of chronic catarrh. It is best administered in the form of decoction, in making which, care should be taken to strain carefully, as the hairs of the pappus of the flowers sometimes irritate the gullet and excite much uneasiness there. It cannot be prescribed in combination with acetate of lead.

Cetraria Islandica, or lichen Islandicus, or Iceland liverwort, or Iceland moss. Notwithstanding the encomiums which have been passed upon it by Scopoli, Hertz, Schneider, Stoll, Wansdorff, Sir Alexander Crichton, and other justly distinguished physicians, it is doubtful whether this plant possesses any expectorant influence. "In phthisis," says Sir Alexander Crichton, "its good effects consist in improving the matter to be expectorated; in diminishing the frequency of the cough, and rendering it more easy; in calming the irritability of the patient, and in preventing or much moderating hectic fever." (London Medical Journal, vol. x., page 229.) He, however, admits that it did not fulfil his hopes, in the cases which he saw treated with it at Vienna; and we have never seen any benefit derived from its use as an article of diet. In preparing it, the bitter should not be entirely extracted; as, in that case, it is merely a nutritive substance, well calculated for phthisical patients, but possessing no medicinal influence.

Among the inorganic substances of this division of expectorants, *ammonia* and its *carbonate* are admirably adapted to free the bronchial system from the load of mucus which oppresses it, after attacks of acute pneumonic inflammation in debilitated habits, especially when the expectoration suddenly stops and suffocation is threatened. They operate by the influence which they exert on the nervous system, without augmenting, in an equal ratio, the action of the heart and arteries. The dose of both preparations must be regulated by circumstances: that of the carbonate may be carried to gr. x. or even gr. xv., and repeated every second hour until the effect is produced; after which the dose should be diminished and the intervals extended. Owing to the heat of fauces which it causes in the act of swallowing, it should be involved in some mucilaginous substance, such, for instance, as a combination of the compound powder of tragacanth in almond emulsion.

b. The general expectorants which affect the pulmonary excretories by the nausea which they induce, are few in number. In attempting to explain their mode of operating, we must take into consideration the similarity between the function of the skin and that of the mucous membrane of the bronchial tubes. Both are exhalent organs; and both, in febrile and inflammatory states of the system, are liable to suffer constriction capable of impeding their exhalent function, and giving origin to a train of symptoms depending on a deficiency of the natural lubricating mucous secretion. In this condition of the mucous membrane, antimonials and nauseating remedies relax this constriction, and enable the secretion to proceed; but still it may be demanded—in what manner do such nauseants promote expectoration? It is probable that, during the state of constriction of the bronchial exhalents, any mucus then existing in the air-tubes is of a very acrid character; but as it remains adherent, it excites no effort for its expulsion: when, however, the constriction is relaxed, and it becomes diluted and moveable, it still remains sufficiently acrid to stimulate the glottis and larynx, and thus to call into sympathetic action the whole set of respiratory muscles requisite for the effort of coughing, to expel the now loosened mucus. This explanation is not completely satisfactory; it explains the mode in which the viscid mucus is diluted, but not well that by which it is expelled.

Among the antimonials, the *precipitated sulphuret* was formerly much employed in asthma and chronic catarrh, but the uncertainty of its operation has greatly narrowed the chances of its influence proving beneficial; and as tartar-emetic answers every indication, it is now generally preferred. For expectorant purposes, tartar-emetic is given in minute doses; for instance, from one-tenth to one-fourth of a grain, repeated at short intervals. In order to secure its expectorant effect, the surface of the body should be kept moderately warm. It is sometimes combined with squill and other vegetable expectorants; but these combinations improve neither the powers of the tartar-emetic, nor those of the other matters with which it may be combined. Its influence, however, is augmented by the addition of opium, which has been erroneously supposed to diminish the bronchial exhalation; on the contrary, it not only aids other expectorants, but promotes it when given alone: an effect which is to be attributed partly to its increasing the natural secretion of the mucous membrane, partly to its sedative property diminishing the irritability of that membrane.

Before closing this article, it is necessary to offer a few remarks on the circumstances which should regulate us in our selection of expectorants. The first object is to ascertain the nature of the cough, whether it be connected with a state of inflammatory action in the pulmonary organs, or with one of debility; and in that case, whether it be kept up by nervous irritation. In every pulmonary disease attended with cough, there is reason for thinking that the early symptoms are those of inflammation; at that period, therefore, expectorants are of little value, except as auxiliaries in bringing on a crisis; but after the inflammation is partly subdued, then the most salutary effects are obtained from expectoration. In this stage of the disease, the nauseating expectorants are to be preferred; but when the inflammatory action is wholly subdued, those stimulating substances which we have described as calculated to produce the expiratory effort necessary to throw off the load of mucus with which the lungs are oppressed, are then required. It is easy to conceive that thickened, or, as they are termed, well concocted sputa, which are generally sufficiently glutinous to adhere together in masses, will be more easily detached and ejected by coughing than a thin mucus, whether accumulated in the tubes, or spread out upon their sides. The necessity, therefore, of ascertaining whether the disease be one of excitement or debility is essential: it is necessary, also, to take into consideration the period of the attack, whether it be the commencement, middle, or termination, when we are called upon to prescribe; for although each of these periods may be benefited by expectoration, yet the substances employed to effect this require to be very different in their characters, according to the period in which they are given. In illustration of this point, we have only to take as an example a case of pneumonia. In the commencement of the attack the bronchial tubes are comparatively dry; but if this state be overcome, either by the use of the lancet, or by a tendency to a spontaneous crisis, the quantity of mucus is then preternaturally increased, and is often tinged with blood. The most favourable symptom in this state is a free expectoration; the most unfavourable, the sudden cessation of it. Our object, therefore, should be to aid this effort of nature, or to produce an artificial state resembling it; not with the view of throwing off morbific matter, but upon principles of a sounder pathology. In the commencement of the attack, if there be any reason for endeavouring to promote expectoration, it must be effected by the gentlest means; such, for instance, as the inhalation of warm aqueous vapour, or by nauseating doses of ipecacuanha, tartar-emetic, and opium. Full vomiting, in this state of the chest, is also, occasionally, highly beneficial; and although, on a prima-facie consideration of its mode of action, it may seem at variance with the means just recommended, yet, by favouring a transfer of action, it often induces an increased secretion of mucus from the pulmonary exhalents, productive of the most marked relief. To effect this benefit, however, the vomiting must be full and maintained for a specific time, certainly not less than an hour. If, notwithstanding the employment of these means, the expectoration become too abundant, so as to obstruct the free entrance of the air into the lungs, then the stimulating expectorants are indicated, squill, ammoniacum, the balsams, ammonia, and the topical application of the expectorant gases.

The nauseating expectorants are equally indicated in the commencement of catarrhs, especially in the epidemic variety termed influenza. After bleeding moderately, and the administration of an emetic, the best results have followed the employment of small doses of ipecacuanha, in combination with squills and opium; but when the febrile symptoms have disappeared, and cough attended with a thin frothy excretion only remains, the balsams, gum-resins, and opium, administered in the evening and at bed-time, prove generally highly beneficial. The same precautions are requisite in the administration of expectorants, in the commencement and in the advanced stages of phthisis. In the greatest number of cases of asthma of a recent date, some degree of inflammation is present; but from the progress of the paroxysm, and its termination in expectoration, an erroneous notion was entertained that the solution of the paroxysm must necessarily follow its appearance; and, consequently, squill, ammoniacum, and other stimulants, instead of the nauseating expectorants, were inconsiderately prescribed, and often produced injurious consequences. In that variety of asthma, however, which appears to depend on a state approaching to that of paralysis of the system of the par vagum, in which the bronchial cells, being deprived of their nervous energy, do not contract sufficiently to aid the expulsion of the air in expiration, and, instead of aiding, prevent the necessary change of the blood in the pulmonary circulation, the nauseating expectorants prove hurtful, by keeping up that state of diminished excitability which is the result of the morbid condition of the bronchial nerves. It is in such cases, and in the low stage of pneumonic inflammation, when the febrile symptoms assume a typhoid character and the lungs are loaded with mucus, that the inhalation of the expectorant gases, the internal administration of the balsams, and more especially of ammonia, prove undoubtedly beneficial.

[Almost every class of medicinal agents may become expectorant according to the precise condition of the system generally, or the pulmonary organs particularly; and hence we find an expectorant effect equally from depletives, and from tonics and excitants; from narcotics and counter-irritants; and from nauseants and emetics.]

Under all circumstances there are three general rules to be kept in view in administering expectorants:

1. The surface of the body should be kept moderately warm, and even in a gentle or breathing perspiration.
2. Whatever determines to the kidneys must be avoided.
3. Purging is not only not to be promoted, but to be most carefully guarded against; for as the action of the secreting vessels of the lungs and those of the intestines are opposed to one another, expectoration is checked when purging occurs.

A. T. Thomson.

EXPECTORATION.—This word (from *ex* and *pectus*, strictly signifies the *act of discharging* any matter from the chest, but by a figure of speech it is also commonly applied to the *matters discharged* from the lungs and air-tubes.

The act of expectoration is one of the instances of combined movement in the respiratory machine, which, by an admirable and harmonious consent between its numerous muscles, unerringly produces such a variety of actions. The function of respiration is of such vital importance that accumulations or effusions which obstruct it endanger life itself. The structure of the bronchial tree contributes greatly to the easy removal of any superfluous matter in it that might cause such obstruction, for the sum of the area of its branches being considerably greater than that of the trunk, or of the trachea, the air commonly finds easy entrance into the air-cells, and, on its more rapid return in expiration, carries with it the superfluous matter. Thus ordinary respiration tends to prevent, in spite of gravitation, any accumulation in the air-tubes; but the excretion is more completely effected by coughing and special efforts of expectoration. These consist of a quick and forcible expiration, preceded by a deep inspiration, and accompanied with a constriction of the larynx and trachea, the effect of which is to bring any superfluous matter into positions from which the air, forcibly expired, drives it through the glottis. It is worthy of remark that expectoration cannot effectually take place without a previous full inspiration, by which air is carried beyond the accumulating matter; hence, when this is prevented, either by weakness of the respiratory powers, or by the impermeability of the bronchial tubes, the excretion is suppressed. The first of these causes of obstructed expectoration is exemplified in adynamic fevers, which may thus prove fatal: the second occurs in pneumonia in the stage of hepatization, and, if extensive, must lead to a fatal obstruction of the respiratory function. They probably occur together towards the fatal termination of bronchitis, phthisis, and other severe diseases of the lungs.

Expectoration in its other sense, namely, the matter expectorated, is a subject well worthy of a careful study; for its characters often furnish signs of the greatest value in the diagnosis, prognosis, and treatment of diseases of the chest. It can scarcely be said that the examination of the sputa is entirely neglected in this country; but we have had frequent occasion to observe that opinions are very loosely and vaguely formed from it, and of a nature quite inconsistent with the present state of pathological science. Thus the presence of pus in the expectoration is frequently looked upon as a sure proof that the lungs are "diseased;" whilst the far more pathognomic sputa of peripneumony and the well-marked secretion of acute bronchitis are hardly recognized.

The natural secretion of the bronchial mucous membrane is a colourless liquid of somewhat glutinous quality, like a thin solution of gum arabic. It does not greatly differ in chemical composition from the serum of the blood, and it owes its viscidity to an animal substance, which Dr. Pearson, (Phil. Trans. 1809,) Dr. Bostock, (Elementary System of Physiology, vol. ii.) and Berzelius (Annals of Philosophy, vol. ii. p. 382) concur in considering an imperfectly coagulated albumen. This secretion is the basis of most of the varieties of expectoration; but, unhappily, our knowledge of animal chemistry does not enable us to discover the precise nature of the changes in composition which produce these varieties. All that we learn is that albumen, in different forms and proportions, is present; for, whether the expectoration be mucus, serum, pus, tuberculous matter, or coagulated lymph, the chemist can discover in these but scarcely discernible varieties of this same principle. There seems to be a considerable variation in the proportion of saline matter in different kinds of expectoration; and on this depends a distinction, formerly much insisted on, by means of the salt or sweet taste. This criterion certainly fails in distinguishing pus from mucus; but we think that an excess of saline matter may be taken as a sign of inflammatory action in the mucous membrane. It is by its mechanical and visible conditions, however, that expectorated matter is most distinctly characterized; and to examine these fairly, the entire sputa should be collected in one or more convenient vessels of white ware or glass, in which their quantity, colour, and consistence, can be minutely scrutinized.

In acute bronchitis there is at first a diminution of the natural quantity of the bronchial mucus, with a sense of roughness and dryness in the larynx and trachea; but soon a saltish liquid is secreted, which increases as the inflammation reaches its height. It is transparent, almost colourless, and moderately viscid, resembling raw white of egg diluted with water. It generally retains a good many air-bubbles within it, and if expectorated with much coughing, it is usually covered with a froth. When poured from one vessel into another, it falls in a stringy or ropy stream. Andral (Clinique Médicale, tom. ii.) considers that its viscidity is in proportion to the intensity of the inflammation; an increased viscidity being always accompanied with an aggravation of the fever, dyspnœa, and other symptoms. When the bronchitis is attended with fever, he remarks that the sputa become more viscid during the febrile exacerbation; insomuch that one inexperienced might be led to suppose that the inflammation had extended to the parenchyma of the lung: after the paroxysm, however, they return to their former state. At the height of the inflammation, and at other times when the cough is violent, they are sometimes streaked with blood: this is produced by the efforts of coughing, and does not tinge the whole mass. These characters are sufficient to distinguish the expectoration of bronchitis in its first stages; and as long as it remains in this state, there is no improvement of the symptoms; but when the sputa become pearly or opake, or of a yellow or greenish-white appearance, we may be pretty confident that the inflammation is on the decline. This opacity is first perceived in the morning expectoration, and in a few points only; and it is uniformly accompanied with an amelioration of the symptoms. The evening exacerbation sometimes brings back the glairy transparency of the secretion; but, unless there be relapse, the opacity returns on the succeeding morning, and gradually extends to all the expectoration, which is then nearly opake, and greenish or yellowish white: the smoke and dust in the respired air sometimes communicate a grey or dirty tinge. This change is often remarkably conspicuous after the successful operation of a sudorific; and, in fact, free perspiration will sometimes partially accomplish it early in the disease. After the expectoration has thus become *ripened* or *concocted*, it is coughed up readily, and in loose distinct pellets, which, although glutinous in themselves, do not so readily unite into one mass as before; they gradually diminish in quantity, and in a corresponding degree the cough and other symptoms cease: a relapse is equally marked by a return of the expectoration to its glairy transparent state. Sometimes a cold is prolonged by a series of relapses; and, notwithstanding the length of its duration, the sputa retaining the same character, the affection preserves its chronic form, and does not terminate until the same change has taken place. These successive transitions, which were noticed by Hippocrates and Aretæus, are highly useful to the practitioner in discovering to him the state of the disease, and, taken with the pulse and physical symptoms, will safely guide him in the employment of his remedies.

The expectoration in chronic bronchitis is of a very diversified character, and is therefore much less certain in its indications. There is generally in it, opake, yellowish, or greenish-white mucus, like that expectorated at the termination of the acute disease; but it is usually more diffluent, and often floats in a pituitous or serous liquid. The same mucus is sometimes voided in a more inspissated form. Andral describes it as resembling false membranes, and moulded into the shape of the bronchial ramifications; and Dr. Cheyne (Pathology of the Membrane of the Larynx and Bronchia, p. 147,) and Laennec give accounts of a similar expectoration. In the milder cases the mucus thus modified constitutes the whole expectoration; but in a severer form of the disease purulent matter is added, and the appearance, consistence, and odour of the sputa present very great variety.

Many tests have been devised to distinguish pus from mucus; but from what we have before remarked on the close similarity of their chemical composition, it may be judged that they pass by insensible gradations into each other. [Nor does the microscope exhibit any marked difference in physical character, structure, and apparent composition between them. (Donné, *Coun de Microscopie*, p. 177: Paris, 1844.)] The utility of minute distinctions of this sort may therefore well be questioned, as they neither enlighten us on the pathology, nor guide us in the practice. Pus is much less viscid than mucus, and not retaining air-bubbles, as mucus does, it commonly sinks in water, whereas mucus generally floats at the surface; and this test gives us as much as is useful in the distinction. When the two are mingled in various proportions, this and all other tests fail in discriminating them. Proceeding from different parts of the bronchial membrane in different degrees of inflammation or morbid affection, some portions of the expectoration are mucous and viscid, whilst others are purulent and diffluent; some greenish-white like pus; others grey, dirty-looking brown, or tinged with blood: generally they are inodorous, but sometimes they exhibit a remarkable fetidity. These characters, however varying, are unquestionably diagnostic signs of chronic inflammation of the bronchial membrane; but their value in the prognosis and in practice is greatly diminished by the circumstance of such chronic inflammation being frequently complicated with other lesions. It almost always, for instance, accompanies the last stage of tubercular disease in the lungs, generally furnishing a great part of the matter expectorated; and its existence is of small importance compared with the phthisical lesion. An inspection of the expectoration alone often fails to distinguish these combined cases from those of simple chronic bronchitis. In general, it may be said that purulent sputa indicate a severe form of disease; but they neither necessarily imply phthisis, nor any other irremediable malady. The chronic bronchitis excited by habitual inhalation of dust or powder, as among needle-pointers, leather-dressers, porcelain-makers, &c., is commonly attended early with purulent and bloody expectoration; but if the cases are treated in time, and the patients are removed from the continued application of the exciting cause, they generally recover. So also, severe cases succeeding to measles and scarlatina sometimes present purulent expectoration, yet they are far from being universally incurable. We repeat, therefore, that puriform matter in the expectoration, as a prognostic sign, only indicates an aggravated form of disease.

The nature of the expectoration gives the distinctive characters to the diseases termed by Laennec dry and pituitous catarrh. The former is a kind of asthma, attended with no other expectoration than scanty pellets of very tough grey mucus, which lodge in the bifurcations of the bronchi, and sometimes cause severe fits of asthma. It is important to recognize the expectoration of this disease, as it is singularly benefited by the alkaline treatment recommended by Laennec. Pituitous catarrh, or humoral asthma, is remarkable for the profuse watery expectoration which accompanies its paroxysms. This discharge contains albumen, coagulable by heat, and seems to differ but little in nature from the serum of the blood. Its quantity is sometimes enormous, amounting to several pounds in weight. These two forms of secretion sometimes occur at the same time in different portions of the bronchial membrane; and the serous discharge, in smaller quantities, is a common accompaniment of chronic bronchitis.

The expectoration of pneumonia is very characteristic. For the first two days there is seldom any expectoration; but, about the third or fourth, a viscid transparent liquid is spit up, uniformly tinged with a rusty or orange hue. At first its viscosity is not so great but that it can be poured from one vessel into another, and it falls in strings or ribands; but in proportion as the inflammation reaches its height, and passes to the stage of hepatization, it becomes so glutinous that the vessel may be inverted, and even shaken without its falling. The red tinge is generally proportionably increased, but this is a less certain test than the viscidity, of the intensity of the inflammation. If the inflammation declines or is mitigated, the sputa become less viscid and rusty, until they present the characters of the expectoration in bronchitis. It is to be regretted that this valuable and truly distinctive sign does not show itself early and constantly in the disease. When it is present, it may confidently be depended on, but its absence by no means disproves the existence of pneumonia. In some individuals it never occurs; and in children it is difficult to obtain a sight of the expectoration. It is also important to know that many adults, like children, invariably swallow the expectoration. The physical signs are, therefore, alone to be depended on in the diagnosis of negative cases. As a prognostic guide the sputa are highly instructive. The unfavourable import of a late appearance of the sputa was noticed by Aretæus; but M. Andral first pointed out the proportion which their viscidity bears to the intensity of the inflammation. As long as this goes on increasing, or remains undiminished, we may be sure that the inflammation is predominant; but if the expectoration shows a disposition to return to the colourless and less viscid state of simple bronchitis, the disease may be known to be on the decline. In a few cases the expectoration increases in viscidity up to the hour of death, but more generally it is either suppressed or changed, particularly if the inflammation have proceeded to the stage of suppuration. The suppression of the expectoration was considered by the ancients an unfavourable omen; modern pathology discovers that it is so, either because it proves the inability of the patient to expel it, or because the secretion has ceased, and the inflammation passed to the hepatized and suppurated stages. In the former case suffocation must soon ensue from the accumulation in the bronchi: in the latter the rusty expectoration is often replaced by other kinds. Sometimes it consists of brownish dirty-looking opaque mucus; sometimes whitish specks, as of pus, are seen in it, and, rarely, it is entirely purulent.

M. Andral describes another kind of expectoration, which he considers generally to indicate the stage of suppuration. This is a deep reddish-brown and slightly viscid liquid, like the juice of preserved prunes or liquorice water. In six out of nine cases in which this was observed, the lung was found, on dissection, in the state of purulent infiltration; in two it was hepatized; the remaining case was a slight one, and recovered. Laennec does not attach any importance to this kind of expectoration, considering it only as the sign of a cachectic or scorbutic habit. It certainly cannot be considered distinctive, but it may be taken presumptively, and must generally be looked upon as an unfavourable sign. The tinge of the characteristic peripneumonic sputa, which is, in different instances, greenish-yellow, orange, rust-coloured, and bright-red, obviously proceeds from the colouring matter of the blood, intimately mixed with it in various proportions. If the inflammation terminates in resolution, this tinge diminishes and disappears, and the sputa exhibit the characters, and go through the changes of the expectoration in bronchitis.

In pure pleurisy there is either no expectoration, or one simply of a catarrhal nature. The fluid secreted in chronic pleurisy has been sometimes known to make its way into the bronchi, and to be evacuated by expectoration; but other signs must rather be depended on for discovering the nature of such a case; as a similar expectoration is sometimes derived from a pulmonary abscess, and even from sudden and copious secretion from the bronchial lining only.

The character of the sputa has been more cousulted in the diagnosis of consumptive diseases than in any other; but the advances which have of late been made in developing the true nature of tubercular phthisis, have proved that all the distinctions and tests proposed are more or less fallacious. Thus it was long held that the presence of pus in the expectoration was a pathognomonic sign of pulmonary consumption; and all efforts were directed to find out a sure method of detecting it and of distinguishing it from mucus. We have already remarked that purulent expectoration is not an uncommon consequence of simple bronchitis, and this disease presents all the phases formerly ascribed to phthisis. Something of the prognosis may, we believe, be learnt by consulting the expectoration, but its distinctive characters are to be depended on only after repeated examinations, and in combination with other signs, particularly those of auscultation.

In the first stage of phthisis, that of miliary tubercles, there is either no expectoration, and the cough is dry, or it is of a simple bronchitic nature. When the lungs are thickly studded with miliary tubercles, there is not unfrequently an abundant serous secretion like that of pituitous catarrh, which is accompanied with a constant and general mucous rhonchus in the lungs. Whenever these present themselves for any length of time in an individual of tuberculous diathesis, and especially if there be any irregularity of resonance on percussion about the clavicles, we consider the fate of the patient almost certain, and the disease will probably run a very rapid course. Except in this case, and in that of hæmoptysis, which is treated elsewhere, (see PULMONARY APOPLEXY and HÆMOPTYSIS,) the expectoration does not assist us in the first stage of phthisis.

The characters of the sputa in the second stage, or during the softening and evacuation of the tubercles, would be much more distinctive were they not always mixed up with the mucous and mucopurulent secretion of a chronic bronchitis, which always more or less prevails at this period. Hence the signs, as relating to the tubercular disease, must be considered in a corresponding degree ambiguous. Attentive examination will often discover in the mucus expectorated fine whitish streaks, which consist of the softened tubercle; more rarely there are little yellowish white masses like grains of boiled rice, which are portions of crude tubercle. As the softening proceeds and the cavities are enlarged, the sputa become less frothy, sink in water, and are principally composed of greenish white masses of irregular shape and outline, sometimes tinged in parts of a dirty red or brownish colour. These flatten at the bottom of the vessel like a piece of money, whence they have sometimes been called *nummulary* sputa. In some rare instances small portions of the pulmonary tissue itself have been detected with the preceding. When the disease is further advanced, the expectoration assumes a brown, dirty green, or grey colour, and the sputa are frequently surrounded with an areola of a bloody tinge. It is exceedingly difficult to say what degree of weight should be attached to these several appearances, even when they are unequivocally seen. It might be supposed that the presence of the whitish streaks or of the little white masses would be conclusive, as being themselves tubercular matter; but appearances of the same kind may present themselves from other sources. The minute bronchical ramifications, in chronic inflammation, sometimes secrete a purulent liquid, which may produce the same streaky appearance; and vermicular concretions and filaments of yellowish white lymph formed in the same way may be mistaken for little fragments of tubercle. The little rice-like bodies, which were considered by Baglivi, and Bayle, and even by Hippocrates, as indications of phthisis, are moreover closely simulated by certain sebaceous concretions formed in the tonsils, and, according to Andral, by similar productions from follicles in other parts of the pulmonary mucous membrane. The white matter from the tonsils may, however, be always distinguished, as Laennec has pointed out, by their fetid odour and by their greasing paper when heated; and without attention to this test, the sign cannot be depended on. The globular yellowish white masses, like irregular balls of flock or wool, which apparently consist of pus held in shape by a little tenacious mucus, have been noticed by several writers as peculiar to phthisis. Dr. Forbes (Transl. of Laennec, 3d edit.) says that this kind of expectoration has appeared to him to be most common in young subjects of a strongly marked strumous habit, and in whom the disease was hereditary. A precisely similar appearance is, however, sometimes presented by the sputa in chronic bronchitis. The dirty brown or green matter, flattening and becoming nummulary when separate, and when together forming a smooth sluggish *purilage*, which appears later in the disease, and takes its origin from the tubercular excavations, is much more certainly characteristic of phthisis. To sum up, we may say that an *occasional* examination of the sputa, by far the greatest part of which, as Laennec has remarked, proceeds from an accompanying bronchitis rather than from the tubercular disease itself, can only enable us to distinguish phthisis in the very rare case of tubercular matter, or portions of the tissue of the lung being present: but with Dr. Forbes and M. Andral, we think that by a daily careful inspection of the expectoration, we shall not fail to find in the successive and progressive changes which it presents, the means of forming a pretty accurate diagnosis, which, if confirmed by the general and physical signs, will leave no shadow of doubt.

As our design in this article has been rather to direct the attention of the practitioner to the importance of expectoration as an aid in diagnosis and prognosis, than to give a complete account of the subject, we refer for further descriptions to the articles in which the diseases of the chest are particularly treated of.

In conclusion, we would strongly recommend our readers to consult the second and third volumes of Andral's *Clinique Médicale*, and Dr. Forbes's translation of Laennec's *Auscultation Médiate*, where they will find instructive and convincing proof of the assistance which the expectoration gives, especially if taken in conjunction with the physical signs, in the distinction and treatment of diseases of the chest.

C. J. B. WILLIAMS.

[**EYE, DISEASES OF THE.** (See Amaurosis, Ophthalmia, &c.)

FARCY. (See Glanders.)]

FAVUS. The pustules termed *favi* are so named from the character of the crusts by which they are succeeded; these being cellular, and fancifully compared to an irregular *honey-comb.* The term favus, however, was differently employed by the ancients: Galen applied it to ulcers which exude, through small orifices, a matter resembling honey in consistence: Celsus regarded it as synonymous with *miliary.* Favi, in the modern acceptation of the word, are small, yellow, irregularly circular pustules, nearly flat—at least, not accuminated; and, according to Biett, always depressed in the centre. Their base is slightly inflamed; they generally appear in circular patches or clusters; are attended with itching, and frequently with glandular swellings from absorption of the matter. These pustules are succeeded, after some days, by a thick yellow, nearly semi-pellucid, somewhat cellular, augmenting crust or scab; at which time they frequently exhale a very offensive, nauseating odour, not unlike that of the urine of a cat. As the crusts dry, they become white, and easily detached.

The seat of favi is most commonly the scalp, in the epidermal layer which covers the papillæ of the true skin. As they most commonly occur on parts covered with hairs, Dr. Duncan advanced an opinion that the disease is in the bulb of the hairs, which are indeed easily detached, and display a swelling at the base. Biett accords with this opinion; but Rayer dissents from it, and supports the view which we have adopted.

Favi generally occur during childhood; they seldom affect the general health, although, when they appear during the period of dentition, they seem to be in a great degree connected with the disordered state of the digestive organs which more or less attends that period, and the increased irritability of the habit. They occasionally, however, appear in adults, on the neck, ears, and occiput: in these cases they are always preceded by some degree of constitutional derangement; headach, an uneasy state of stomach, loss of appetite, irregular bowels, and fever: the inflammation surrounding the pustules is more extensive, and the crusts are thicker and harder than in childhood. Alibert affirms that cooks are very liable to eruptions of favi. They are chiefly known as the distinctive feature of one species of porrigo,—P. *favosa;* under the head of which we shall have again to direct the attention of our readers to their characters. Biett (Abrégé pratique des Maladies de la Peau, par MM. Cazemene et Schedel, p. 231,) supposes that minute pustules of porrigo *scutulata,* which appear in circular patches, are favi, differing only in their arrangement and some little variation in the state of the crusts; but as far as we are enabled to form an opinion by the appearances which they present, when viewed with a powerful magnifier, the opinion of Bateman, (Synopsis, edit. 7th, p. 138,) who regards them as achores, is correct. Rayer (Traité théorique et pratique des Maladies de la Peau, par P. Rayer, vol. i. p. 520,) considers both the pustules and crusts intrinsically different from those of porrigo favosa.

As we shall have again to detail the treatment of favi under the article porrigo favosa, we have only to mention, at this time, that it consists in correcting the irritable state of the stomach, and in not permitting crude undigested matters to remain in the alimentary canal. This is best effected by moderate doses of hydrargyrum cum creta, combined with antimonials, administered at bed-time; and alkaline salts, particularly subcarbonate of soda, in combination with calumba, or cascarilla, or cinchona bark in powder, given twice or three times a day. It was the opinion of Ætius and other old writers, that danger attended the repulsion of favi: modern practitioners, regardless of this, employ a variety of external applications; but these are general mild stimulants, intended rather to restore the healthy action of the skin, after the crusts have been removed by poultices, than to repel. They consist of ointments composed with the oxides of zinc, acetate of lead, and tar with sulphur; and the ointment of nitrated mercury largely diluted with simple cerate. When there is much itching or pain, the writer of this article has seen great benefit derived from the following lotion, applied in a tepid state, in the form of a poultice.

R. Liquoris plumbi subacetatis, f.ʒiss.
Acidi hydrocyanici, f.ʒii.
Aquæ destillatæ, f.ʒvi. M. Fiat lotio.

Cleanliness, exercise in the open air, and the stimulus of soap and hot water, are great aids to every method of treatment. Much depends on diet, which should be apportioned both in quantity and quality to the powers of the stomach and the general strength of the patient. If the patient is weak, which is generally the case, the food should be nutritive, but not stimulant; we have found nothing answer better than milk, with a moderate allowance of plainly cooked mutton or poultry once a day. Wines and all kinds of fermented liquor are injurious.

Favi appearing under the form of porrigo favosa* are contagious; and it is probable that they are equally so when they suddenly appear as symptomatic of derangements of the stomach and chylopoietic viscera; but we have seen no positive demonstration of their contagious nature under these circumstances.

A. T. Thomson.

FEIGNED DISEASES. It is our intention to notice under this head all that class of alleged corporeal disabilities which are either pretended or intentionally induced. In strictness of classification, cases of this kind should be arranged in four groups:—

1. Feigned diseases, strictly so called, or those which are altogether fictitious.

2. Exaggerated diseases, or those which, existing in some degree or form, are pretended by the patient to exist in a greater degree or different form.

3. Factitious diseases, or those which are wholly produced by the patient, or with his concurrence.

4. Aggravated diseases, or those which, originating in the first instance without the patient's concurrence, are intentionally increased by artificial means.

It is not, however, our intention to adopt this classification in the present article. We shall arrange all the diseases under one head, and in alphabetical order; this method being more simple, more in accordance with the general plan of this work, and affording greater facilities for practical reference. We may also here observe, that, for reasons of convenience, we shall apply the term *feigned* to all the varieties of these disabilities.

The following are the classes of persons by whom diseases are chiefly feigned, and the causes of their being so:—

1. Men apprehensive of being levied, or actually levied, or forced into the military or naval service; conscripts; men liable to serve in or to be drafted for the militia; impressed seamen. The cause of diseases being feigned by such persons is the hope of being deemed unfit for the duties of the public service, and thus to escape it altogether.

2. Soldiers, and seamen in the navy. The causes which induce these persons to feign disease are chiefly the following:

a. To obtain their discharge from the service, with or without a pension.

b. To avoid the performance of the duties imposed on them; to escape some particular service that is disagreeable to them, or to obtain some other that is agreeable; to obtain a removal from one climate or station to another; to obtain the ease and comfort of an hospital, &c.

c. To avoid an apprehended or adjudged punishment.

Soldiers and sailors feigning disease are commonly designated as *malingerers* or *skulkers*. The latter term is exclusively used in the navy.

3. Slaves. These unhappy persons feign diseases from many of the motives which influence the soldier and sailor, whose services are compulsory; only they do not seek for a permanent discharge from their labours, which they know to be impossible, except indeed by death. Their chief objects are to obtain relief from labour, and to enjoy the comparative comforts of the hospital.

4. Persons who have subjected themselves to the control of the laws, and are either undergoing punishment or in apprehension of it; persons about to undergo a trial for some alleged offence, or about to be punished for the same; prisoners for debt, or other offences, civil or criminal. The motives of such persons for feigning diseases are sufficiently obvious, viz. to evade or escape punishment or restraint.

5. Persons in civil life who have received slight injuries, and who greatly exaggerate their degree or consequences. This is generally done with the view of extorting a disproportionate compensation from the party injuring.

6. Persons in the lower ranks of life desirous of exciting the attention and compassion, and consequently the bounty of the public, or a maintenance in idleness. This class comprehends the professed mendicant, whether vagrant or stationary, whether gipsy or gentleman-beggar; and also persons in the lower ranks among the poor, who occasionally in this manner practise on their richer neighbours. Under this class, also, come persons in the lower ranks of life who wish to obtain relief from benefit societies, or from the parochial funds, or to gain admittance into or to remain in workhouses, hospitals, &c.

7. Persons not at all in poverty nor living in a constrained position, who assume the semblance of disease from some inexplicable causes. These are chiefly females; but the class is, on the whole, very small.

We might add to these, other classes from various conditions of life, from the boy "creeping like snail unwillingly to school," up to kings, warriors, statesmen, and various others in high stations, whom history records as having assumed sickness to gain particular objects;[*] but the above, we believe, contain nearly all the cases that are likely to come under the notice of the medical practitioner.

Some diseases or disabilities are much more easily feigned than others, and the imposture is more difficult to detect. In those diseases of which the symptoms are naturally obscure, or variable and uncertain, much care should be taken not to come to a wrong conclusion. Every medical practitioner knows that there are some diseases which are not indicated by a change of the pulse, an alteration of the natural colour or temperature of the body, or by any evident derangement of its functions. There are also other diseases the symptoms of which are capable of being imitated by the effects produced by certain drugs, or by the use of certain external applications, &c. An intimate knowledge of the anatomy, physiology, and pathology of the human body, and of the effects of the articles of the Materia Medica, is therefore essential to enable the medical practitioner to obviate false conclusions and detect imposture in such cases.

When a medical practitioner is called upon to examine, for the purpose of legal investigation, or to treat a doubtful case of disease, he should endeavour to obtain all the information he can respecting the person's moral and physical habits, his probable motives, &c. &c.; and he should also consider whether the alleged causes of disease are founded in fact, or are probable. Another important point is, to endeavour to ascertain whether the pathognomonic symptoms of the alleged disease are present. "It is obvious," says Dr. Cheyne, "that the more we know of disease by reading and observation, the more patience and temper we possess, the more successful shall we be in the detection of imposture. I am convinced that simulated disease will soonest be discovered by those who conduct the inquiry in the most scientific manner, carefully applying the case in doubt to the description of the disease in standard works of pathology." (Letter to Dr. Renny, on Feigned Diseases; Dublin Hospital Reports, vol. iv.)

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[*] Many great names, illustrative of the statement in the text, might be mentioned. The plan adopted by Ulysses to avoid leaving his young bride for the war of Troy, is familiar to the classical reader. The particular manner in which this royal malingerer chose to exhibit his alleged infirmity, and the mode of its detection, are pleasing illustrations of the rude simplicity of early times. The king goes as usual to his agricultural labours, but not as usual like a sober ploughman; he yokes together in the same plough a horse and an ox, and sows his field with salt in place of corn. With the view of putting to the test his alleged disease, Palamedes places Telemachus in the furrow before the father, who betrays his sanity by carefully avoiding the infant. The history of the feigned insanity or idiocy of the elder Brutus is equally well known; as is that of Amnon the son of David, who "made himself sick" for a more guilty purpose. Charles, Duke of Bourbon, constable of France, wishing to desert to the emperor, "feigned sickness in order to have a pretence for staying behind." — (Hume.) In like manner,

————————" Hotspur's father, old Northumberland,
Lay crafty-sick,"

to avoid the battle of Shrewsbury. Essex, the favourite of Elizabeth, is said to have feigned a violent disease to move her compassion; and Raleigh pretended "madness, sickness, and a variety of diseases, to protract his examination and procure his escape." (Hume's James I.) Pope Julius III. feigned sickness, to avoid the holding of a consistory; "and, that he might give the deceit the greater colour of probability, he not only confined himself to his apartment, but changed his usual diet and manner of life." By persisting in this plan, however, he contracted a real disease, of which he died in a few days.—(Robertson's Charles V.) It would be easy to add greatly to the above list, from the stores of tradition and authentic history, ancient and modern.

It is difficult for the simulator of a disease to give a consistent account of the origin and progress of his alleged infirmity. By a little management on the part of a medical practitioner, an impostor will almost always be led to enumerate incompatible symptoms, or greatly to exaggerate unimportant lesions. He is constantly prone to overact his part. He is too anxious to impress upon the medical attendant the reality and the severity of his sufferings. Remarks are thrown in purposely to obviate objections, and to reconcile the mind to what may seem extraordinary in the narrative; all of which are very unlike the bold simplicity of truth.

With the view of inducing a detected or even suspected impostor to acknowledge his deceit, severe measures, such as the infliction of pain, &c. remedial agents, and even formal corporal punishment, have been occasionally adopted. This practice, however, if it were justifiable, will be frequently found to fail even in the army or navy, where patients are under the control of strict discipline. But it ought to be a general rule that means should never be adopted in the treatment of a doubtful case, which we should regret having employed if the alleged disease were to prove genuine. Soldiers and sailors commonly return to their duty when they are deprived of all hope of succeeding in a scheme of imposture; and finesse will often succeed in detecting imposture, where harsh measures would completely fail. Dr. Davies, surgeon to the East India Company's depôt at Chatham, had a soldier under his care with an alleged affection of the back, which, the man asserted, rendered him unable to move or be moved from his bed. His alleged disability had existed for about a month, without any indication that he intended to return to his duty. For the convenience of being watched, &c. he had been accommodated in a ward by himself. Dr. Davies, who considered him to be an impostor, saw no prospect of his *giving in;* but he eventually put in practice a measure which led to detection. He went to the window of the ward in the dusk of the evening, and, after gently tapping upon the glass, he in a low voice called the man by his name. He was at the window in an instant, and Dr. Davies had the pleasure of congratulating him on the recovery of the power of locomotion. The man forthwith went to his duty.

Sometimes impostures are discovered entirely by accident, even when they are not at all suspected to exist. The following is a curious instance of this kind. A seaman on board H. M. ship Otter feigned a chronic decline so effectually, that he not only deceived his surgeon, but the physician of the Naval Hospital to which he was sent; and he was about to be discharged from the service, when the true nature of his case was elucidated in an unexpected manner. The mail from the sea-port where the man was in hospital was robbed, and the letters were broken open with the view of searching for money. The robbers were, however, taken, and the letters recovered. Among the opened letters was one from the man in the hospital to his wife, wherein he informed her that his scheme had succeeded, that he was going to be invalided on a certain day, and desiring her to make good cheer against his arrival. This letter was forwarded to Capt. W., and, in consequence of its contents, the man, although seemingly in almost a dying state, was returned to his ship. The letter being read to him, and his hopes thus destroyed, he at once returned to his duty.

It is frequently useful to depart from the usual mode of examining doubtful cases; preconcerted plans being thereby disconcerted, and an impostor puzzled. One of the writers of this article was requested to look at an old soldier who had been long in a civil hospital on account of an alleged contraction of the left knee, the real existence of disease being doubtful. The examiner went to the left side of the bed upon which the man was lying, and after looking at the contracted knee he desired the man to lie upon his face, by which change the right extremity assumed the place of the left in the bed. The examiner's hand was then placed upon the *right* knee, which became gradually flexed, while the contraction of the left knee disappeared. This man's attention was so completely engaged with the right knee when it was under examination, that he forgot that it was his left knee which he had alleged to be contracted.

It might be an amusing subject of inquiry how particular diseases come to be assumed in preference to others. Our limits will not permit us to enter upon this investigation. A principal, if not the chief cause, is the relative facility with which diseases may be feigned or formed; some, as we have already observed, being much more easily assumed than others. Imitation of the real diseases which the impostors are in the habit of seeing is also at once a frequent source of their knowledge, and the exciting cause of their putting it to account. We have thus known soldiers and sailors carefully study and mimic numerous ailments of their comrades. We remember the case of a soldier who imitated admirably and successfully the gait of a patient with hip-disease, which he had studied from the life in a boy who actually laboured under that affection.

We know not that any excuse is necessary for the extent of the consideration which we purpose to give to the subject of the present article. Certainly none will be expected by those of our readers who either now practise, or formerly have practised, in the medical departments of the army or navy, who are fully aware of its great importance. If there be any practitioner in civil life who entertains doubts on this point, the facts detailed in the present article will, we think, be found more than sufficient to remove them. And although it is especially in the practice of the medical officers in the public service that cases of feigned diseases occur, yet their occurrence in private practice, particularly among the patients of our hospitals and dispensaries, is by no means extremely rare; and many of them are of such a kind as to expose the knowledge or ignorance of the physician or surgeon more positively and more conspicuously than any other cases. Many of them, also, become the subjects of legal investigation, and require medical testimony to be given in courts of law.

In the army and navy it is the duty of the medical officers to protect the public service from impositions of this kind; and it is well known to those officers who served during the late prolonged wars, how seriously the service both of the army and navy suffered from such impostures being oftentimes successful. On the decision of the medical practitioner as to the true character of doubtful cases, very frequently depends the acquittal or punishment of the alleged invalid; and every one must feel the responsibility of such a position. It is well known to those who have had opportunities of judging, that men in the army and navy, more particularly the latter, have been often treated and punished as impostors, who were really labouring under disease; and also that real impostors have often received the immunities and privileges that ought to belong only to the diseased. The scene in *Roderick Random*, of the captain and doctor curtailing the long sick-list, is probably only a slight exaggeration of what Smollett may himself have witnessed in the olden time of the navy; and although no such scene could be exhibited now-a-days, it must be allowed that nothing but that firmness of purpose which can alone be founded on the knowledge of disease, will always enable the medical officers in that department of the public service to protect the rights of humanity and the dignity of the profession of medicine.

1. **Abdominal Tumour.**—(*Ascites, tympanites, physconia.*)—Various affections of the abdomen characterized by external swelling are often both feigned and formed by persons desirous of obtaining certain objects under the cloak of disease. We have seen dropsy simulated for some time successfully, merely by the individual pushing the abdomen forward while in the erect position, and elevating the spine when lying on the back; probably, at the same time, keeping up the distension by means of very short expirations. A complete exploration of the uncovered abdomen will always detect imposition of this kind. It has been proposed in such cases to observe the patient when asleep: but such simulators are sometimes prepared for this test, and wrap themselves up so completely in the bed-clothes that the end cannot be obtained without awaking them.

A more effectual mode of deceiving is, to distend the abdomen by the introduction of foreign substances. Instances are said to have occurred among the French conscripts where water was actually injected into the cavity of the peritoneum, and a true factitious ascites thereby produced. Fodéré mentions the case of a woman who produced a simulated ascites by inflating the cellular substance of the abdominal parietes with air, through a small and scarcely perceptible puncture in the groin. (Médecine Légale, tom. ii. p. 485.) Manual examination or palpation would immediately detect this kind of deception. Tympanitic distension of the abdomen by artificial means has been more extensively and more successfully practised. MM. Percy and Laurent mention the case of a young soldier who had the power of distending his abdomen enormously by swallowing air. Presenting himself in this state, with clothes made for the occasion, he had no difficulty in obtaining his discharge. He got rid of his tympany at will, "par le moyen d'eructations druyantes et non interrompues, par haut et par bas." (Dict. des Sc. Méd. t. xli. p. 328.) The following extract from Dr. Cheyne's excellent paper on feigned diseases, in the fourth volume of the Dublin Hospital Reports, will show the extent to which this mode of deception is sometimes carried. "In the year 1811, from thirty to forty men of the 84th regiment were admitted into the King's Infirmary, labouring, as stated on the admission-ticket, under dropsy and intermittent fever. The abdomen was greatly distended and felt tympanitic; the tongue, with few exceptions, was clean; pulse regular; urine natural, and bowels in general costive. The men complained of pain in the right side, and many of them of pain over the whole abdomen, with excessive thirst, drinking more than a gallon of water daily. The disease was at first considered a consequence of the Walcheren fever; but, from the numbers increasing, and all with the same symptoms, Dr. Harvey was led to conclude that the complaint was feigned. Under that impression he prescribed a solution of Glauber salts in weak tobacco-water, which he called the *infusum benedictum;* a cupful of this detestable compound was given in the morning, and repeated every fourth hour till it operated, and with perfect success; all who were in the hospital recovered speedily, and the disease, which was becoming epidemical, soon disappeared; however, sixteen had succeeded in obtaining their discharge before this method of treatment was discovered." It was reported that the men produced this artificial tympany by swallowing large quantities of chalk and vinegar. Is this probable?

Simulated dropsy, or other abdominal tumour, is a common deception of mendicants, and is by them usually accomplished by the aid of cushions fitted to the belly. A remarkable case of this kind is related in the *Act. Nat. Cur.*, of a woman who practised this imposition for forty years, and made a comfortable livelihood by it. No tumour was found on examining the body after death; but a pad found in her wardrobe, weighing nineteen pounds, and fitted to the shape of the abdomen, explained the case. A man not long since obtained his living in Edinburgh by the same means; on being detected he enlisted as a soldier.

2. **Abstinence, Partial or Total.**—Abstinence for a great length of time is sometimes feigned in order to excite public curiosity, and, consequently, commiseration and charity. Abstinence beyond a moderate period is contrary to the usual course of nature, and therefore strong suspicion may always be entertained when extraordinary fasting is

alleged. The most noted imposture of this kind in recent times is that of Ann Moore, the fasting woman of Tutbury. According to her own account she fasted from March, 1807, for a period of six years. She certainly fasted for nine days and nights. (Edin. Med. Journ. vol. v.) For numerous references to similar cases the reader is referred to the *Litteratura Medica* of Ploucquet, art. *Inedia*.

3. **Animals in the Stomach.** — Mendicants occasionally allege that they have an animal in their stomach. There was a man not long since in Edinburgh, who was remarkably successful in deceiving the public by pretending that he had such an inmate, which he said occasionally came to his throat, a statement he attempted to corroborate by making the most frightful grimaces. It may be mentioned, as in some degree illustrative of the means of deception in such cases, that one of the writers of this article has now under his care a patient affected with partial obstruction of the pylorus, who has the power of producing the most extraordinary noises in his stomach by throwing the abdominal muscles into strong action. The stomach is no doubt enlarged, and as it generally contains an immense quantity of liquid and also much air, the sounds are occasioned by the rapid commixture of these fluids of unequal density. There is a case recorded in the 9th volume of the Edinburgh Medical Journal, which is remarkable, inasmuch as Dr. Spence, the reporter, details the circumstances as gravely as if he had no doubt of the fact. A woman, twenty-one years of age, having been indisposed for a few days, took some cathartic medicine, and passed by stool "a reptile of the lacerta species." The animal, of which a particular description is given, on the sole authority of the patient, is stated to have been between four and five inches long, and considerably thicker than a finger.

4. **Blindness, Total or Partial.**—This disease is frequently feigned by wandering beggars, and also by men in the military and naval services. The most common form of assumed blindness is amaurosis; but at other times paralysis of the eye-lids, producing blindness by preventing the access of light, is the alleged disability, and in this case an artificial ophthalmia is often induced at the same time. In feigned amaurosis, if the simulator is skilful and courageous, the deceit is with the more difficulty detected, because in true amaurosis there is sometimes a certain degree of motion in the iris. A remarkable case of pretended blindness is related by Mahon, in which the patient was placed on the steep bank of a river, and desired to walk forward. He unhesitatingly did so, and fell into the stream. This test was considered as a proof of the reality of the disease; but he was afterwards induced, on a promise of being discharged the service, to confess that the disease was feigned. (Méd. Légale, tom. i. p. 366.) In this case the pupil contracted perfectly; and although this may be no certain proof of soundness of the organ, it is perhaps fair to admit immobility of the iris on exposure to light as a sign of disease. In the following case the deception was equally complete, but the detection came from a different quarter. A seaman on board the Utile frigate, pretending to be totally blind, and believed to be so, was on one occasion permitted to go on shore, and was attended by a man to lead him about the streets. These two happened to quarrel, and even came to blows, when the blind man finding, as might be expected, that he was likely to have the worst of the fray, suddenly regained the use of his sight, and soon got the upper hand of his astonished guide. The latter being worsted, took to flight, was pursued through a great part of the town by his former protegé, and, finally, received a severe beating from him. Next day the impostor was severely flogged, and never afterwards exhibited any deficiency of vision.

Blindness under the form of amaurosis used to be simulated to a great extent by the conscripts for the French army, and for some time with the desired effect. A dilated pupil and an inactive iris, the leading symptoms of this disease, may be induced by the extract of belladonna, the substance supposed to have been employed. When a sufficient length of time is permitted, the means of detecting this fictitious amaurosis are obvious. It has been stated by good authority that two hundred conscripts were exempted from serving in the army by using belladonna.

Intermittent blindness (nyctalopia, hemeralopia) is much more frequently and successfully feigned by soldiers and sailors, more especially in warm climates, where the real disease is of very frequent occurrence. In tropical countries night-blindness occasionally prevails among Europeans epidemically, and hence arise at once the source of the imposture and the difficulty of detecting it. Night-blindness is a common disease in Egypt, and was frequently feigned by our soldiers in the expedition under Abercrombie. "Of some corps," says Dr. Cheyne, "nearly one-half of the men were affected with this complaint, or pretended to be so, for which, however, a remedy was soon found. In the parties engaged in the works, a blind man was joined to and followed one who could see, in carrying the baskets filled with earth; and when the sentries were doubled, a blind and a seeing man were put together, and not without advantage, as during the night hearing upon an outpost is often of more importance than sight." (Loc. cit. p. 146.) In tropical climates sailors frequently feign this disease with the view of escaping night-duty. It is hardly possible to detect the imposition by mere symptoms, as in the real disease the aspect and functions of the eye are perfectly natural in full light.

5. **Cachexia, malacia, or pica Africanorum.** (Mal d'estomac, dirt-eating.)—This is a disease which often produces the most extensive ravages among the slaves in the West-Indies, carrying them off slowly, but with the certainty of a pestilence. It is not nearly so common now as formerly, negroes being much more valuable to their masters, and better treated. It is often a real disease, but it is often, also, a practice voluntarily adopted by the unhappy beings who are the subjects of it, with the object and with the effect of producing death. Still more frequently, perhaps, it is a mixture of real and factitious disease, the primary disorder of the stomach prompting to the ingestion of crude substances, and thus giving the particular direction to the suicidal propensity. Whether it exists as an irresistible propensity, or

is adopted as a means of producing disease, the practice of dirt-eating is always done in secret, and is invariably denied. All kinds of earth are eaten indiscriminately, such as the common soil or mould, and the plaster of houses, &c. The disease produced is truly a cachexia, marked by disorders of various functions, diminution of the colouring matter of the blood, &c. and terminating in general dropsy. The patients first complain of pain of stomach (hence its French name), then breathlessness, and inordinate pulsation in the heart and large arteries, particularly of the carotids and aorta, on motion. They become bloated, their nails and the palms of their hands becoming white, and their lips, gums, tongue, &c., quite pallid. These symptoms continuing, anasarca follows, and death, in the great majority of cases, closes the scene. When the practice is carried to a great extent, it may be discovered by examining the stools, which will be found to consist in a great measure of the earth swallowed. Emetics are also administered for the same purpose, and the ejected matters being washed, the earth will be found to subside. (Dancer's Jamaica Practice of Physic.)

Various means have been adopted to prevent this practice, and, among others, the affixing to the face an apparatus to prevent eating altogether except in the presence of the overseers; but all are found of no avail while the insignia of slavery are on their bodies, and the hope of freedom in another life is in their hearts. "Negroes," says Dr. Williamson, "anticipate that they will, upon death removing them from that country, be restored to their native land, and enjoy their friends' society in a future state." And upon this, the last consolation of those wretched beings, one of the means of checking the suicidal epidemic is founded. The negroes imagine that if decapitation is performed after death, the transition to their native country is prevented, and hence has been exhibited the horrid spectacle of the heads of the dead negroes placed in some conspicuous situation before their fellows. (Williamson's Med. and Miscell. Obs. on the West Indies, vol. i. p. 93.)

6. **Catalepsy.**—This disease has often been feigned, sometimes in its characteristic form, but more commonly in some of its imperfect varieties. We have nothing to add to the notice of this simulated affection in the article CATALEPSY in this work.

7. **Circulation, disorders of the.—Disease of the Heart.**—In the French army, during the rigid operation of the conscription, almost every severe disease was simulated with the view of obtaining exemption from service, and many were adopted by the conscripts, the simulation of which must have been suggested by persons well acquainted with disease. The authors of the article on simulated diseases in the Dictionnaire des Sciences Médicales mention two cases which were intended to pass, and very nearly did pass, for aneurism of the heart or great vessels. In one of these a ligature was found tightly bound round the neck, and another round the top of each arm. On removing the ligatures, the purple and swollen state of the countenance disappeared, so that the man did not look like the same person, and the disordered action of the heart ceased. In the other case, a very fine ligature was so tightly bound round the neck as to be almost hid by the folds of the skin. This young man announced himself as affected with organic disease of the heart, and his terribly swollen and livid face certainly gave credibility to his statement.

It would appear from the testimony of several writers on the complaints of soldiers and sailors, that these persons are in possession of means of great power to derange the functions of the heart, and thereby to simulate and even to produce disease of that organ. Dr. Cheyne is convinced that many soldiers have the power of quickening their pulses and giving violence to the heart's action, and states that he has frequently found a soldier's pulse, at the time of an expected visit, one hundred and twenty, or one hundred and thirty, and the same reduced thirty or forty beats within a quarter of an hour upon his repeating his visit unexpectedly. (Loc. cit. p. 165.) Seamen are said to produce such a temporary quickness of pulse by striking the elbow forcibly against a beam of wood, and this state they quaintly term *the elbow-fever*. More or less permanent derangement of the circulation is produced by the internal use of tobacco, digitalis, tartar emetic, &c.; and it is well known to all old medical officers in the army and navy that these means are familiar to the skulkers and malingerers of the two services. A much more effective means of deranging the circulation, and, indeed, many other functions, is afforded by white hellebore taken internally; and it appears from a paper of Dr. Quarrier, published by Mr. Hutchinson, that it has been extensively used in the army for this purpose. The practice was introduced into the regiment of marine artillery by a man who had formerly lived with a veterinary surgeon. This man not only produced the disorder in himself, but sold his secret and his drugs to many others. When a sudden and decisive result was sought for, as much as a drachm of the hellebore was administered; but for the more slow and progressive mode of deception, a small dose, such as from four to ten grains daily, was prescribed. The larger dose usually occasioned vomiting, purging, syncope, tremors, and great nervous irritability, which were followed by great and inordinate action of the heart and arteries, and this was in its turn succeeded by great debility, and sometimes by a disposition to paralysis. By the smaller dose, the stomach after a short time became completely disordered, and much nervous irritability and consequent derangement of the circulation ensued.—Various other symptoms were observed in consequence of this poison, and in some cases a fatal result was very nearly induced, and would have been so in many cases, Dr. Quarrier thinks, had not the medicine fortunately been adulterated. Many men succeeded by these means in obtaining their discharge from the service. (Hutchinson's Pract. Observations in Surgery. Second edition, p. 149.)

8. **Contraction of the Limbs producing Lameness.**—This disability is often feigned by soldiers and sailors, and very frequently by mendicants and persons who wish to escape the punishment of "hard labour." A convict who was confined on board the Retribution hulk at Woolwich, during the period of his sentence, which

was seven years, kept his right knee bent so as not to touch the ground with his foot all that time; and he was on that account not set to hard labour with the other convicts. He was commonly employed in executing light jobs, which he could do in a sitting posture. When he moved from place to place, he used to hop upon the left foot with the assistance of a stick. At the end of the seven years he was discharged, and upon going away he very coolly observed, "I will try to put down my leg, it may be of use to me now." He did so, and walked off with a firm step without his stick, which he had previously thrown away.

Mr. Hutchinson considers this imposture as that which is most common in the navy next to ulcer, and relates some curious cases. A young seaman fell from the yard-arm into the sea, and pretending, when taken up, that he had struck his loins on the ship's anchor during his fall, and had thereby broken his back, he was sent to Deal Hospital. No external evidence of injury could be discovered, but he obstinately persisted in his story, and in proof of the alleged fact, he constantly kept his trunk bent at nearly right angles with the lower extremities. When a rug was placed on the floor, and he was laid upon his back upon it, his legs and thighs were kept erect in the air; and when these were pressed down forcibly, he rose suddenly to a sitting posture, as if his hip-joints were anchylosed. He persevered in his deception for some time, but was soon after detected in the act of deserting from the hospital, running lustily for his liberty. A sailor on board the Druid pretended that his arm was contracted, and so immovable was the elbow-joint that the ulna and humerus had the appearance of being anchylosed. From long want of use, the muscles were wasted. The man had been for a long time excused from duty for the supposed disease. Mr. Hutchinson detected the imposture by a stratagem. Being brought up to be punished, and while eagerly engaged in conversation with the captain, his attention was withdrawn from the limb, and Mr. Hutchinson, who had hold of it, suddenly straightened it without the least effort, in the presence of the whole crew. The man was punished, and immediately returned to his duty with the perfect use of his limb. (Loc. cit.)

The following cases have come to our own knowledge. In a line of battle ship, an excellent seaman, and a favourite with his officers, suddenly withdrew from his duty, alleging that he had been seized with a violent pain in the loins which prevented him from assuming any other than a bent position. He was long treated as a real sufferer, and every kind of application (many very severe) was used for his recovery, but in vain. After a period of many months, the surgeon was superseded by another, who soon began to entertain suspicions of the reality of the disease, and made every effort, both by severe treatment and watching, to detect him. But, by day and night, asleep or awake, the patient still retained the same position. At length, however, this accomplished dissembler, like the pretended blind-man formerly mentioned, was betrayed by the violence of his own passions. One day, being accused by a messmate of skulking, he was so incensed that he started up erect, and with all his power inflicted a severe chastisement on his accuser. He now confessed his deceit, and alleged as the cause of it the unjust and injurious conduct of one of his officers.

A seaman on board the Heron sloop pretended that he had lost, in a great measure, the use of his lower extremities, which were contracted; and he was for a long time carried by his messmates from one part of the ship to another. He was at length sent to the hospital at Barbadoes to be surveyed, and being declared an impostor, was ordered to be taken on board his own ship to be punished. On his way from the hospital, however, being made aware of what was waiting him on board, he suddenly started up in the cart, and leaped into a field of sugar-cane, and, although pursued by his attendants, succeeded in making his escape.

During the late war, a seaman was received into Gibraltar Hospital on account of a fractured leg. When this was nearly cured, he began to pretend that the ankle-joint was contracted and the foot turned inwards. This position he obstinately maintained for twelve months, in spite of every effort to restore the limb to its proper position, and in defiance of the harshest treatment. One night, however, he contrived to get intoxicated, and the surgeon having occasion to visit his ward during the night, found him lying perfectly naked on his bed, and his ankle quite straight. He was immediately returned to his ship as an impostor, was punished, and exhibited no longer any contraction of his ankle.

While transcribing this for the press, a flag-officer of the navy informed the writer that he was once member of a court of officers who invalided a seaman on account of a contracted knee-joint, which had resisted all kinds of treatment for a long period. On the day after he was discharged, he was seen walking upright by this officer in the town of Sheerness, and, being pursued, made his escape by a most nimble and active use of his legs.

One mode employed for detecting these pretended contractions is to place a tourniquet on the limb above the joint, by which the muscles are prevented from acting, and the joint becomes in consequence movable. In cases of marked imposition of this kind, the naval surgeon has sometimes transferred his patient to the captain. In cases of stiff knee-joint, the practice adopted by one disciplinarian was to cause the skulker to be lashed on the back, with small cords, by the boys, until he could *run away* from them. Of course no surgeon would give his sanction to such treatment.

9. **Deafness.**—Loss of hearing is not unfrequently feigned in the army and navy, and also by persons in civil life who wish to escape a public trial or to excite commiseration. Simulated deafness is, in general, alleged to come on rapidly, whereas the real disability takes place very gradually. Two recruits complained that they had been suddenly attacked with deafness without any previous illness. The state of the meatus was natural, and no sign of inflammation existed. The surgeon first employed the antiphlogistic regimen, and then inserted a seton in the nape of the neck, which was regularly dressed in the morning. In eight or ten days they both declared that they had regained their hearing, and requested to be allowed to return to their duty. (*Cheyne.*) As in the

case of blindness, the natural but involuntary language of the countenance generally evinces that the impostor continues to gain intelligence of what is going on around him through the organ of hearing. Cases of this kind are commonly detected by a little stratagem, such as making a sudden noise near the patient, or suddenly mentioning something deeply interesting to him, and watching the effect on his countenance or pulse. Foderé mentions several examples of soldiers who betrayed themselves on hearing a sudden noise. Mr. Dunlop mentions the case of a soldier in the York Military Hospital, who feigned deafness so well that firing a pistol at his ear produced no effect. He was, however, detected by the same experiment made after he had been put to sleep by opium: he then started out of bed. (Beck's Jurisprudence, p. 17.)

Accident also has sometimes led to a discovery of imposture, when there was no suspicion entertained respecting the alleged loss of hearing. A remarkable instance of this is recorded by Sir Walter Scott, in the introduction to Peveril of the Peak. A woman pretending to be both deaf and dumb, lived several years in a family, and afforded no suspicion of being an impostor, until, on an occasion of great surprise, she forgot her part, and suddenly expressed her feelings "in loud Scotch." In the same work a beautiful illustration of the manner of detecting the imposture, by exciting strong emotion and watching its influence on the circulation, must be familiar to every reader.

10. **Deaf-dumbness.**—This is a very common imposture among mendicants. It is also not unfrequently feigned in the military and naval service. It is of importance to know, that if a person has ever acquired the use of speech and is able to move his tongue, his dumbness cannot be real. Many singular examples of this imposture are recorded by authors; but the most remarkable is that of Victor Foy or Travanait, detailed at great length by Foderé. (Loc. cit. p. 478.) This man, after deceiving a vast number of medical men in different countries, was at length detected by the Abbé Sicard. Dr. Cheyne mentions the case of a soldier who exhibited this disability for no less a period than five years, but recovered his speech upon being discharged from the service. On one occasion this man was accidentally shot in the ear by an awkward recruit, on which occasion he "expressed pain and consternation by a variety of motions and contortions, but never spoke." (Loc. cit. p. 144.)

In a case of a seaman on board the Utile, who pretending to be deaf and dumb, the surgeon, appearing to be deceived by him, made very formal and ostentatious preparations for an operation upon his throat, and while his attention was thereby engaged, he applied a lighted candle to the man's fingers. He resisted this test, however; and having represented his case to the Admiralty, the surgeon was dismissed his ship for cruel, or at least unprofessional, treatment of his patient. Shortly afterwards, the sailor being still detained in the ship, recovered both speech and hearing. He subsequently pretended to have lost his speech only; but, finding that this faculty was not considered essential to the performance of the severest duties of a seaman, he speedily regained his tongue. This man was of a very different temper from the simpleton of whom Parr speaks. "How long have you been dumb, my good friend?" says a passenger, with the most insidious humanity. "Three weeks, Sir;" replied the incautious deceiver. (Parr's Medical Dictionary.)

11. **Diarrhœa and Dysentery.**—Bowel complaints are sometimes feigned by soldiers and sailors, and others, more particularly in countries where dysentery is prevalent, as in India. The motive for simulating this disease is commonly the escape from some particular duty. The imposture is easily detected by obliging the patient to use a night-chair; but care must be taken that he does not borrow, buy, or steal the leading symbol of dysentery, or manufacture it expressly for the occasion. Mr. Hutchinson informs us that he has known convicts break down in their urinary utensils a figured motion, and intimately mix it with the urine so as to induce the belief that it was in reality a diarrhœal evacuation, (Loc. cit.); and one of the writers of this article was informed by a West-Indian planter that the same deception is practised by the slaves in that country to escape labour. He knew an instance of a negro who had nearly rooted out all his teeth by tearing his gums with iron nails, in order to procure blood to make the factitious dysenteric motion more complete. These unhappy persons do not always content themselves with feigning these affections; they actually produce them by deleterious substances taken into the bowels; and Mr. Hutchinson says he has not unfrequently known them fall victims to their own imprudent attempts. It would appear that the seamen under Mr. Hutchinson's care made use of vinegar and burnt cork to effect their purposes. Mucous discharges are produced by introducing suppositories of soap or other irritating substances into the rectum, and these may be subsequently mixed with blood. (*Cheyne*, p. 170.)

12. **Ear, Diseases of.**—A purulent and fetid discharge from the ear has been simulated or induced by soldiers with the usual object of obtaining their discharge or escaping from duty. An instance is mentioned in the *Dictionnaire des Sciences Médicales*, where honey was used to simulate a morbid discharge; and the cheat was very near proving successful. A more common practice is to introduce irritating substances, such as cantharides, into the auditory canal, and thus to excite inflammation and purulent discharge; and to render the discharge more disagreeable, rancid oil, and other stinking matters have been afterwards employed. In these, as in so many other cases, careful examination will detect the imposition.

13. **Emaciation and Debility.**—An appearance of unsound health is occasionally simulated for the purpose of procuring an exemption from some disagreeable service, or to obtain leave of absence, change of climate, &c. The means commonly employed are abstinence from sleep and food for a considerable time, drinking to excess of strong liquors, and frequently taking small doses of the tartrate of antimony.

Partial emaciation, or wasting of the limbs, is a much more common resource of the impostor, more particularly among mendicants. In the army or navy it is hardly possible for the individual to find time or opportunities to produce the compression by which it is effected. Sometimes, however, the circumstance, not very rare among adults, of one arm being considerably smaller than the other, is taken advantage of, and the impostor pretends that the wasting is of recent occurrence, and is accompanied with loss of muscular power or with pain. The Earl of Gloucester, afterwards Richard III., had an arm of this sort, and is related to have taken advantage of it for purposes of deception.

Every one must have seen mendicants at country fairs, exhibiting one or both arms hanging down fleshless and motionless by their sides. Almost all these have been in the first place intentionally produced by long-continued bandaging, and the greater number have in reality become powerless.

Partial wasting of a limb may, however, be a real disease; we are not, therefore, to decide on such cases without due examination. In most instances the knowledge of the surgeon will enable him to discriminate between the real and the pretended disability; but we have known instances in which the discrimination was extremely difficult.

14. **Epilepsy.**—This disease is very frequently simulated in the streets. It is also not seldom feigned by soldiers and sailors for the purpose of procuring their discharge. Nevertheless, the practitioner who is intimately acquainted with the pathognomonic symptoms of epilepsy, and pays proper attention to the case, will generally be able to satisfy himself whether an alleged paroxysm of the disease be simulated or not. During a feigned paroxysm of epilepsy the contractions of the different parts of the body do not come on simultaneously; and if a patient be narrowly watched, he will be discovered to open his eyes occasionally for the purpose of observing what effect his exhibition has upon the by-standers. The simulator of epilepsy is unable to produce the red, bloated countenance and contorted face which accompany the real disease, or the immobility of the iris on the access of light. He is also apt to exhibit the appearance of foaming at the mouth either in too slight or in too great a degree. The latter result is produced by a piece of soap kept in the mouth. A marked difference between the real and feigned disease is, usually, that in the latter the patient courts publicity for his exhibitions, and makes no attempt to conceal his malady, while the real epileptic is almost always extremely desirous of hiding his infirmity. It will, likewise, be found on inquiry, that the feigned paroxysm is apt to come on very opportunely to promote the attainment of some object of desire to the patient, while the real disease shows no such intelligent consideration. It is further to be observed, that the skin is comparatively cool when the contraction of the muscles is involuntary; but if the agitation of the body be voluntary, the skin is covered with perspiration. A feigned paroxysm of epilepsy usually terminates much more abruptly than the true disease, and the convulsions are not succeeded by the comatose or soporose state that generally supervenes on the epileptic convulsion.

The most decided proof of epilepsy is, however, an insensibility to the influence of external agents; consequently, when any evidence of sense is excited by stimulants during the paroxysm, it may generally be inferred that the symptoms are counterfeited. For the purpose of testing the degree of insensibility, various means may be tried in doubtful cases. The following are some that have been used by military and naval surgeons, and often successfully.

1. A powerful general shock to the system, as by a pailful of cold water suddenly dashed upon the patient. We have more than once seen this treatment succeed in putting a period to the paroxysm; but we did not always, on this account, satisfy ourselves that the disease was feigned. So powerful a shock is not unlikely to arrest real convulsions.

2. A strong impression made upon particular senses. Mr. Hutchinson mentions a case supposed to be feigned in which the convulsions were instantly removed by blowing "some fine Scotch snuff" up the nostrils through a quill. This induced another fit—a fit of sneezing—that lasted nearly a quarter of an hour; and there was no return of the epilepsy while Mr. Hutchinson remained in the ship. The same practice was tried in real cases of epilepsy by this gentleman, but he never could produce any similar effects, although the patients were not snuff-takers. Dr. Cheyne thinks the most powerful stimulant that can be used in such cases is a few drops of alcohol introduced into the eye, and relates a case where the pretended epilepsy was instantly arrested by it. The introduction of stimulating or very nauseous remedies into the mouth, so as strongly to impress the sense of taste,—stuffing the mouth with common salt, or forcibly introducing a solution of aloes, &c., is thus often effectual in putting an end to the feigned disease.

3. The apprehension of pain or danger, excited by the proposal of an operation in the patient's hearing, or by actually placing him in a situation where he must injure himself if the convulsive movements are continued. We are informed by a naval officer that he once saw a tremendous epilepsy instantly cured by an order being given to introduce a red-hot ramrod into the patient's anus; and the dread of the actual cautery, though in a somewhat less formidable mode, has often proved a powerful remedy in similar cases. Perhaps an equally effectual plan is to *propose* to pour boiling water on the legs, and actually to pour *cold* water. Dr. Cheyne relates an ingenious expedient put in practice in a case of feigned epilepsy, by Mr. Young, surgeon of the 10th regiment. A large barrack-table was put upon another of the same dimensions, and the pretender placed, in the midst of his paroxysm, upon this elevated bed. The fear of a descent put an immediate termination to the epilepsy. (Loc. cit. p. 154.)

In concluding these remarks, we wish to impress upon the mind of the young practitioner that he is not to be too positive in imagining that he will always be able to decide with certainty whether the ostensible epilepsy is feigned or real. In all doubtful cases, it is due to his own character as a man of honour and feeling, and due to the beneficent profession of which he is a member, that he take the side of mercy; and if he is ever justified in denouncing a patient as an impostor, and thereby consigning him to punishment, he is certainly never justified in being himself the instrument of the punishment. Dr. Cheyne, a man of the greatest experience, and distinguished alike for his candour and accurate observation, informs us that he is "in possession of sufficient evidence to prove that real epilepsy has often been considered feigned;" and our own experience irresistibly leads us to adopt the same conclusion.

15. **Excretion of Calculi, &c.**—Soldiers sometimes feign this affection with the view of obtaining their discharge, and unwilling recruits to prevent their serving in the army. A fit of nephralgia, or passing of gravel, is even pretended, and an alleged calculus exhibited. A similar imposition is practised by females, and occasionally under such circumstances as render it very difficult to account for their conduct. A most remarkable case is recorded in the Edinburgh Medical Journal (vol. vii.) of "a young lady, of rather high rank," who feigned this disease, and was believed to have excreted, with great pain, a vast quantity of calculi, "not less than several pint measures in two or three years." The rudest chemical experiments proved the pretended calculi not to be of animal origin; they were in fact, "common sand and pebble stones." No motive could be assigned for this extraordinary conduct. A similar case in a boy, ten years of age, is mentioned in the Annals of Philosophy, vol. iv. p. 76; and Dr. Thomson of Edinburgh discovered a similar imposition in a woman, by detecting micaceous particles in the alleged gravel. (Beck's Jurisprudence, by Dunlop, p. 7.)

A still more common deception perhaps, and one much more extravagant, is the pretended excretion of calculi from the vagina. Many instances of this fact are mentioned by authors, and many others might be added. In a case mentioned in the Medical Comm., vol. iv. calcined bricks were pretended to be passed from the vagina, and some were extracted from it. A case was mentioned to us not long since, of a young woman from whom many fragments of coal were extracted by a surgeon. But the most remarkable instance of imposition that has come to our knowledge is that of a young woman, the daughter of a farmer near Edinburgh, who, after feigning, forming, or sustaining an immense variety of affections, in uninterrupted series, from 1817 to 1830, at length fixed upon the excretion of bone from the vagina as the great and abiding malady. Among the diseases, real, feigned, or factitious, which this girl exhibited, were hepatitis, epilepsy, amaurosis, aphonia, deafness, paralysis of the arm, gravel, anasarca, hæmatemesis, irregular convulsions, gastralgia, dyspnœa, vomiting of substances resembling liver and bone, and retention of urine. Bone was first detected in the vagina in 1824, while the surgeon was introducing the catheter, and from this period an immense quantity was either extracted or excreted; some pieces were even extracted from the bladder. She was admitted into an hospital in 1825, where she still continued to pass bones, believed for some time to be those of an extra-uterine fœtus; but a complete stop was put to the complaint by secluding the patient from all access to such materials. After her discharge the alleged excretion returned. She had an illegitimate child in 1828, and was finally married to a respectable farmer in 1830. Another young woman, in a respectable rank in life, pretended to pass vesicular bodies from the vagina, and many were extracted by surgical aid. At first the disease was considered natural, but eventually it was discovered by Professor Thomson of Edinburgh, that the alleged hydatids were artificial vesicles prepared from the intestines of a pig. These were so constructed as to resemble a string of beads.

It is hardly necessary to say anything respecting the means of detecting such impositions; it is, however, important that the young practitioner should be made aware of their occasional existence.

16. **Fever.**—This disease is frequently feigned, and also in some degree produced artificially. Soldiers and sailors pretend to have an accession of ague during the night, and present themselves as if in the interval to the surgeon. Sometimes they simulate the fit at a time when they can be more readily discovered. Dr. Cheyne mentions the case of a soldier who pretended to be in *a chill*, and who was seen to be shaking violently: upon throwing down the bedclothes, however, he was found not in the cold, but it in a sweating stage produced by his own exertion. This exposure put an immediate termination to the paroxysm. (Op. cit. p. 175.) Such persons, Foderé says, often imitate admirably the chattering of the teeth of the cold fit. They likewise use means to produce a greater semblance of fever. Great heat and perspiration, and a quick pulse, are produced by strong exercise immediately before the hour of the visit. In the section on disordered circulation, we have noticed various means adopted for the purpose of disordering the action of the heart and arteries, most of which are equally applicable to the production of the disease now under consideration. The skin is sometimes scrubbed with a hard brush to produce redness; and the tongue is very frequently coloured artificially white, brown, or dark, with chalk, pipe-clay, tobacco, brick-dust, and brown soap, &c. according to the convenience or knowledge of the impostor. The sanguinary pirate Loto, who was lately executed at Gibraltar, very nearly succeeded in deceiving his medical attendants by simulating fever, colouring his tongue brown, &c. In all these cases close observation will almost always detect the imposture; and most certainly a few days' confinement will do so. It is only an ephemeral fever that can be feigned with any prospect of success.

17. **Fracture.**—We have seen several soldiers who simulated lameness, and alleged that a thigh bone had been fractured, by which means the limb had become shortened. This imposture is easily detected by placing the man upon his back and examining both the thighs: the muscles of the limb falsely alleged to be shortened will be found hard and in full action, while the muscles of the other limb are inactive and soft. We happened to know one instance of a soldier who obtained his discharge by alleging that he had a plate of metal in his skull, which he said had been introduced there in consequence of the bone hav-

ing been fractured; and we are also aware of an instance where a medical officer was found fault with for having approved of recruits "with plates introduced into their heads." The simulators of this disability must have met with very credulous auditors, for it is to be presumed they did not examine the heads said to be thus mended.

18. **Hæmatemesis.**—This affection is readily simulated, and frequently has been so by soldiers, sailors, slaves, and other persons. It is effected by procuring blood, and after swallowing it, producing artificial vomiting, whereby it is disgorged. The blood is generally that of some animal; but slaves in the West Indies have been known to swallow their own blood to effect their object. A remarkable case is mentioned by Sauvages, of a girl who feigned hæmatemesis to escape from a convent, and who brought up in the presence of the physician several pounds of blood on several successive days. It was at last discovered that she secretly drank bullock's blood before the visit. (Nosol. Method. ii. p. 299.) This imposition will in general be discovered at least in situations where the medical attendant may reasonably expect to meet with feigned diseases, by narrowly examining the symptoms—when a discrepancy and want of harmony will be found among them which nature never presents. When any suspicion is excited, the detection may be made at once by watching the patient, and cutting off the possibility of his obtaining the materials necessary to the simulation.

19. **Hæmaturia.**—This disease has been sometimes simulated by taking substances into the stomach which have the quality of reddening the urine, such as beet-root, the fruit of the prickly pear, madder, &c.; it has, however, been much more frequently attempted to impose by mixing foreign substances with the urine, particularly blood, after it was excreted. The authors of the article *Feigned Diseases* in the Dictionnaire des Sciences Médicales inform us that blood has even been injected into the bladder with this view. A little attention suffices to discover factitious hæmaturia, however produced.

20. **Hæmoptysis.**—This is a disease very commonly feigned by soldiers and sailors, and also by mendicants. The cough is easily assumed, and the sanguineous expectoration is produced by pricking or cutting the gums, throat, or some part of the mouth, or by cutting the fingers or arm and sucking the blood, or by procuring the blood of animals, or by artificially tinging the sputa of a red colour by some foreign substance. Sylvaticus mentions the Armenian bole as being used for this purpose, (Institutio medica de iis qui morbum simulant deprehendendis.—*Madrit.* 1594); Dr. Beck, brickdust; and Mr. Hutchison, vermilion paint. Dr. Cheyne justly observes, that the absence of the symptoms which generally attend real hæmoptysis, such as cough, dyspnœa, fever, &c. will naturally excite suspicion, and the appearance of the sputa will confirm this in such cases. The factitious will be very unlike the real sputa of hæmoptysis. The use of the stethoscope will greatly aid in the diagnosis in doubtful cases. It ought to be a rule in the army, that simple spitting of blood, unaccompanied by signs of organic disease of the lungs, is not a sufficient cause for the discharge of a soldier.

21. **Hæmorrhoids.**—The discharge of blood from the anus is easily feigned or imitated. It appears also that hæmorrhoidal tumours have been very artfully constructed by means of small bladders, inflated and tinged with blood, and attached to a substance introduced into the rectum. (*Percy* and *Laurent*, op. cit.)

22. **Hepatitis.**—This affection is often simulated by soldiers who have been some time in India, when they wish to be discharged. They are commonly well acquainted with the symptoms of the disease, and frequently tell a tolerably consistent story. The countenance and general appearance of an impostor of this kind, are, however, often at great variance with his oral testimony. In doubtful cases of alleged organic disease of the chest or abdomen, the person to be examined should be undressed, as he is then unable to conceal whatever evidence of health may be supplied by a plump frame and muscular limbs. An opportunity is also thus afforded of properly exploring the cavity in which the disease is alleged to have its site.

It is not an uncommon practice with officers in the navy on foreign stations, who are desirous of returning to England, to feign some disease in order to be invalided to a more temperate climate. In the West Indies in particular, this practice was formerly of frequent occurrence; and it is a curious fact that the disease most frequently assumed, and successfully, was that now under consideration, and which is by no means very common among sailors in that country. The causes of this preference in favour of hepatitis are, no doubt, the supposed facility of imposing the belief of its existence on a superficial observer, and the generally received opinion of the tendency of all tropical climates to generate it.

The facts just stated might lead to some curious statistical mistakes. Suppose, for instance, information were sought respecting the relative prevalence of different diseases in different climates among persons in the navy. If the official records of the medical department were inspected for this purpose, it would be found that a large portion of the invalids from the West Indies were affected with hepatitis; and it is probable that the proportion might be greater than among the invalids from the East Indies. Now there cannot be a doubt that liver-disease is, in truth, *much* more prevalent in the latter climate than in the former. Owing to particular circumstances those invalided for complaints of this kind from the West Indies are chiefly officers; and the much greater proportion of this class than of common seamen, in the invalid lists, might be considered as indicating some peculiar causes of hepatitis among officers in that country.

Dr. Cheyne has some very sensible remarks on the feigned hepatitis of soldiers. He says that "when men who have not been in warm climates obstinately complain of pain in the right hypochondrium, and when we cannot discover any enlargement or fulness of the liver, when the pulse and breathing are undisturbed, the secretions and excretions natural, and when the alleged pain resists topical bleeding and blistering, and mercurial purgatives, the sooner we send them to duty the better." Persons in this class often eventually succeed in their object of dismissal from the service, chiefly from the mistakes of the surgeon. "Such subjects," says Dr. Cheyne, "have often come under my care with their flesh and strength reduced by repeated courses of mercury, their gums absorbed, and teeth shaking in their sockets, whose livers were sound (probably they never were otherwise), but whose broken health required that they should be invalided without delay." (Loc. cit. p. 172.)

23. **Hernia and Hydrocele.**—Both these diseases have been frequently simulated. The means most frequently used to effect the object, is inflating the cellular substance of the scrotum. But more artful and more severe means have been adopted. Cases are related in the Act. Nat. Cur. of inflated bladders being applied to the scrotum to impose on the ignorant; and it is to the great discredit of the medical profession that some of its members have aided in the production of deceptions of a more scientific description. In the year 1828, two medical men were tried in France for having respectively, produced in four conscripts swellings of the testicles. It was sworn by one of the conscripts that the operator injected into a wound made by him in the scrotum, a red-coloured liquid which gave him excessive pain. The operation was followed by violent inflammation of the testis. The other operator applied caustic to the scrotum with the same result. This last individual, a surgeon of the name of Desplats, was sentenced to the pillory and five years' imprisonment. The practice of inflating the scrotum is much more common, because more easy. Sir Astley Cooper mentions the case of a man at Norwich who imposed on the surgeon by this means, and thus escaped serving in the army; and we have more than once seen the same plan adopted, but without success, by impressed seamen. A small blow-pipe, or the stalk of a tobacco-pipe, is the instrument commonly used. It is hardly necessary to say that no surgeon *ought* to be deceived by a case of this kind.

Some men have the power of retaining the testes in the groin by the voluntary action of the cremaster muscles; and the swellings resulting from such a position of the parts have been mistaken for hernia. (Hutchinson, loc. cit.)

24. **Hydrocephalus.**—Chronic hydrocephalus has been simulated, at least in one case which we shall quote from Sauvages, who terms the case, after Mangetus, *physocephalus artificialis.* In the year 1593, a mendicant exhibited his child for gain as a monster, on account of the immense size of his head. This preternatural appearance was produced by the daily insufflation of air under the scalp, by means of a pipe introduced into a small perforation on the vertex. By this operation, repeated for several months, the scalp at length became extended to an enormous degree. Being detected, this wicked father was condemned to death. (Nosol. Method. t. ii. p. 497.)

25. **Hydrophobia.**—One would hardly expect that this disease should ever have been feigned. MM. Percy and Laurent, however, mention a case of the kind in a conscript, which, although terrifying the examiners at first, was eventually cured by the threat of suffocation between two beds.

26. **Incontinence of Fæces.**—We have known this disease feigned. A boy on board the Desirée frigate pretended that he could not retain his fæces, and was frequently found voiding them on all occasions and in all places. Being deemed an impostor, he was severely punished, and at last confessed that he had been advised to do so by his aunt, that he might be discharged the service: this result he was very near obtaining. The following remark of Dr. Cheyne, relative to this pretended malady, is very judicious. "When a patient alleges that he cannot retain the contents of the bowels, the sphincter ani ought to be examined, and if it contracts upon the finger, opium, with solid food must be prescribed, and a watch set over the individual: if he passes solid fæces in bed, he will be a fit subject for a court martial."

27. **Incontinence of Urine.**—It is somewhat singular that a disease so very rare as this is among persons not advanced in life, should be one very commonly feigned, more particularly by soldiers. This arises, probably, from the circumstance that the infirmity is easily simulated, and is one particularly inconsistent with the habits of neatness and cleanliness required in a modern soldier. This disease was extremely common among the French conscripts during Napoleon's wars. Its very frequency of occurrence among soldiers is in itself a strong presumption of imposition; and if it makes its appearance at all in an epidemic form, we may be almost certain that it is feigned. MM. Percy and Laurent say they have had no fewer than fifteen pretended cases of this kind at one time in a recruiting depôt; and Fodéré witnessed its occurrence, almost in an epidemic form, in consequence of two soldiers having obtained their discharge on this account. Dr. Cheyne notices a somewhat similar circumstance in an English regiment, in consequence of the facility the soldiers found in imposing upon a practitioner unacquainted with military practice.

Independently of evidence derived from collateral circumstances, there are many means of detecting simulated incontinence. When the disease is real, the clothes of the individual usually exhale a strong ammoniacal odour, which is not often the case when the disorder is feigned. The simulator commonly chooses the time and place which appear to him the best for wetting his clothes: if he sleeps with another person, he is more apt to wet his bed than when he sleeps alone; and if he is furnished with clean straw to lie upon, he does not commonly wet it before the morning. In real incontinence, more especially if it has existed some time, the glans penis is stated by MM. Percy and Laurent to be pale and shrivelled, from being kept constantly wet with the urine which comes away *guttatim*; and Foderé says, if a ligature be passed round the penis in such cases, the urethra will soon be found distended above it. It is evident, however, that this test cannot be depended upon. In the Austrian army, a man who alleges that he has incontinence of urine is furnished with a urinal, and obliged to do his duty. In the French army it was customary to compress the penis between two pieces of wood; and Foderé informs us that he succeeded in putting a stop to a fictitious epidemic of this kind by applying a sealed ligature to the penis, which was only allowed to be undone by a person appointed for the purpose. MM. Percy and Laurent prescribed with perfect success in a case of this kind, twenty lashes on the loins, with the avowed object of strengthening the debilitated part; and the surgeon of a regiment mentioned by Dr. Cheyne, speedily put an end to a pretended epidemic of the same kind by prescribing a cold bath twice a day in Lough Neagh. Such means as these, with blisters to the perineum, and other appropriate but disagreeable remedies, will almost always put an end to this alleged disability, even when we have not been able to demonstrate to the simulator himself that we have detected him. When this is once effected, there is never any difficulty in curing any feigned disease. The most effectual mode of detecting simulated incontinence is that prescribed by Mr. Comyns, an army surgeon, and afterwards by Dr. Hennen and Mr. Hutchinson, viz. to administer a strong opiate at bed-time, and to watch the length of time the urine is retained during sleep; or to introduce the catheter unexpectedly, to ascertain the quantity of urine found in the bladder. In real incontinence, the bladder will not retain its contents after a certain time during sleep, or under any other circumstances. The following ingenious method was successfully used by an army surgeon to detect and cure a fictitious infirmity of this kind. The surgeon having ascertained from the patient how long he could retain his urine, (of course a very short period,) caused him to undress and stand before him with the abdomen exposed. Upon observing the abdominal muscles called into action to aid in the expulsion of the urine, he suddenly and forcibly thrust his fingers against the belly so as to prevent the voluntary muscular effort. This he repeated as often as he saw the action renewed, until the alleged period of expulsion was long passed. He then dismissed the patient with the remark that he had retained his urine long enough to enable him to do his duty.

The opposite state of *retention of urine* has been sometimes feigned, more particularly by female convicts. A strict watch will always detect such an imposition.

28. **Jaundice.**—The yellow colour of the skin in this disease has been simulated by painting it with an infusion of curcuma or tincture of rhubarb, &c.; and it is said clay-coloured stools have been imitated to perfection by taking daily a small quantity of muriatic acid. What it is impossible to feign or to form, however, is the yellow colour of the conjunctiva, and the want of this will always detect the imposition. It will rarely happen that a simulator will be so ingenious as to produce, at the same time, the yellow skin, the pale stools, and the dark-coloured urine. An ingenious device for altering, at least, if not rendering yellow, the conjunctiva, was that of a French conscript, who always put snuff in his eyes before the surgeon's visit. (Dict. des Sci. Méd. loc. cit.)

29. **Madness.**—Mental derangement, in some of its forms of idiocy, melancholia, or mania, has been in all ages assumed as a means of attaining certain objects of desire. The names of many persons famous in ancient and modern times are associated with this imposture. Madness is most commonly feigned in civil life by prisoners to escape punishment. In the army and navy, and among slaves, it is feigned with the same object, as well as to escape from disagreeable labour; but in the army and navy it is still more commonly feigned with the view of obtaining a discharge from the service. In the latter department of the public service, during the late war, in which so many hearts were broken by the hope too long deferred of returning home, every surgeon of experience met with instances of simulated insanity; and it was equally common among the numerous prisoners of war detained for so many years in this country. All the forms of disordered intellect were feigned; but the most common was that of furious madness, assumed with the view of effecting a temporary purpose, such as the evasion of punishment, the removal to an hospital, &c. When the design was to obtain a discharge from the service, melancholia or idiocy was the form adopted. In several instances the simulators succeeded in gaining their ends; in many others they were detected; and we fear that in not a few instances real insanity was mistaken for feigned, and the patients were treated as impostors. This fact ought to lead the medical officers in the public service to study with great care the indications of insanity, and ought moreover to induce them, whenever there is a shadow of doubt, to lean to the side of mercy. It is infinitely better that they should be deceived, than that a poor wretch, already suffering under the most grievous of natural calamities, should undergo additional misery from their ignorance.

The discrimination of the fictitious from the real disease is not always so easy as those who have never witnessed both are apt to imagine. It is true that when we consider the very peculiar and complex phenomena which characterize true madness, and reflect on the general ignorance of those who attempt to imitate them, we have no right to expect such a finished picture as could impose on persons well acquainted with the real disease. And yet when, on the other hand, we consider how imperfectly the operations of the intellect, both in a state of health and disease, are known to medical men in general, and how few opportunities the medical officers in the public service have of observing the phenomena of insanity, and reflect how natural it is for the feelings of honourable men to take the part of ostensible distress, it need not surprise us that the pictures drawn even by such rude hands have imposed on educated minds. But it is less because fictitious madness has been treated as real, than because real madness has been treated as fictitious, that we are so anxious to direct the attention of junior medical officers in the army and navy to the study of the characteristic features of the disease. These can be only thoroughly studied in the receptacles for the insane, but much knowledge of importance may be derived from books. Referring the reader to these sources, we must content our selves in this place with a few general observations.

The form of madness that can be assumed with most facility is that of furious mania; and yet the cases of this which we have witnessed have been all lamentably defective as imitations of nature. The actors always overdid their part. They sought to personify the notion of madness usually entertained by the vulgar, viz. the total abolition of the rational faculty, instead of its partial perversion. It is still more difficult to simulate the quiet half-rational insanity of the melancholic or monomaniac; as nothing but careful observation of persons so affected can qualify an individual for such a difficult task. This statement might be illustrated in a curious and interesting manner by a reference to the writings of poets and novelists. Such persons are obviously much better qualified to paint the disease now under consideration, than the ignorant soldier or sailor; and yet it would not be difficult to point out, in the numerous delineations of insanity presented by authors, such glaring deviations from nature as could not fail to strike any one versed in the history of the disease. Shakspeare, Goethe, and a few others perhaps, might stand the application of the severest test; but the common class of writers who have attempted such delineations have failed completely.

Idiocy has been more successfully imitated; and, perhaps, this may be accounted for by the opportunities which most men have enjoyed of studying the character in the instance of the poor idiot, still to be met with at large in almost every village. Conscripts have pretended that they were incapable of being taught the commonest duties of a soldier; and we knew an instance of a young *player*, drafted into the army, who acted the part of an idiot so effectually that he soon obtained his discharge. Almost immediately after this he enlisted into another regiment, and then deserted.

Independently of the mental phenomena of insanity, there are many physical conditions of the system often present in this disease, which it is hardly possible to feign, such as the expression of the countenance, the state of the eye, of the tongue, &c. One very common symptom, and one indeed invariably present in the earlier stages of furious mania, and in most of the forms of monomania, is sleeplessness; and this it is hardly possible for any man to feign. A real madman will be many days, even weeks, without sleep. This circumstance, alone, if properly taken advantage of, will suffice to detect most impostors; and in order to derive from it all the advantages which it is capable of yielding, a strict and uninterrupted watch should be kept on all patients who are suspected of imposition. In the case of a seaman who enacted under our own eye the part of a furious maniac, in hopes of escaping punishment, sound sleep overpowered him on the second night of his attempt. Abstinence from food is another circumstance respecting which there will often be observed a marked discrepancy between the real and the pretended madman.

A strict watch will also generally detect in the simulated disease, great variations of violence, incoherence, or other symptoms, having reference to the visits of the medical officer, the being overlooked, &c. A pretended maniac will often be tranquil when he believes himself alone, or only in the presence of those of whose opinion he is regardless. A bold and clever dissembler will, however, not leave himself thus exposed to detection. We are informed by a gentleman, once in charge of French prisoners of war in this country, that he has known men (afterwards detected and admitted on their own confession to be impostors) carry their simulation to so exquisite a height as to eat their own excrements, even when shut up in their cells, suspecting they *might* be overlooked.

Real madness is seldom sudden in its attack; feigned madness very generally is so. The real disease usually exhibits itself at first in slight and almost imperceptible deviations from the habitual modes of thinking and acting, not reaching its height in many cases until after a progressive increase of months, or even years; although, perhaps, the change at last from a comparatively slight degree of hallucination to extreme violence has been sudden. The feigned disease, on the contrary, is rarely preceded by such indications, but bursts out in full violence at once, upon the application of some exciting cause. And yet this rule is not without exception in both cases. We have seen instances of sudden and furious insanity in civil life, without any premonitory sign.

The circumstances under which the alleged insanity has supervened, the man's previous character, the probability or improbability of the disease being assumed, and many other obvious considerations, will all materially assist the diagnosis. For instance, if we find a man not previously liable to be so affected, nor hereditarily disposed to insanity, suddenly exhibit the appearance of this disease, under an impending trial or punishment, or other threatened evil, which might be averted by such a state, there is certainly a presumption in favour of the disability being feigned. It is, however, to be borne in mind, that the very same apprehension of exposure, disgrace, or punishment, which affords motives for simulating insanity with the view of escaping them, may give rise to the real disease. Instances of this kind have been mentioned to us as occurring in the public service, and it would be easy to supply others from history and the records of jurisprudence. For this reason, and because we believe, with Dr. Cheyne, on other grounds, that "we are in more danger of supposing insanity simulated when it is real, than of considering that disease to be real when it is only pretended," we must strongly protest against the decision in any case, that the disease is feigned, solely because there appears a strong reason for its being so. Taken in conjunction with the actual phenomena and other collateral circumstances, the consideration of the probable motives will, however, no doubt, in many cases greatly aid the diagnosis.

The existence or non-existence of causes known to predispose to insanity will be considered in every particular case, and they will have their due weight. Of this kind are previous attacks of the same malady, under circumstances where there existed no apparent motive for deceit; the existence in the patient's family of a similar disease; eccentric habits, or what may be termed the maniacal temperament; a decidedly strumous habit; the application of strong exciting causes of a moral nature; physical disorders, especially such as are known to affect the brain, as prolonged intoxication, previous injury of the head, the repression of cutaneous eruptions, &c. &c.

It is well remarked by Dr. Cheyne, that in real *insanity* there is often the greatest insensibility to decency, propriety, and comfort, evidenced by the grossest language in persons previously of very pure minds, by exposure of the person, spitting heedlessly in all directions, passing the excrements in bed, or plastering them on the walls of the cell, &c. circumstances not likely to exist, at least in the same degree, in simulated cases. Yet this only affords us collateral aid in the diagnosis. Fodéré has related the case of a young woman, undoubtedly a pretender, who committed every kind of indecency in her cell; and the miserable trait formerly noticed, of a prisoner of war devouring his own excrements, is a convincing proof that nothing is too disgusting to appal a determined will.

In addition to the means of diagnosis supplied by the actual phenomena of the malady, by its previous history, and by other collateral circumstances, we have, in suspicious cases, a very important means in the institution of plans calculated to outwit an impostor or to overcome his obstinacy. Many harsh measures have been had recourse to in the army and navy, with this view, which are altogether unjustifiable, except in cases of the clearest imposture. In no case, however suspicious, is the medical practitioner authorized to go beyond the employment of means of a strictly professional kind. He may, indeed, use all the artillery of annoyance supplied by medicine, and he may even *threaten* extra-professional infliction, but he must never go beyond this line. When convinced of the imposition in the case of a soldier or sailor, it is the duty of the medical officer to state his opinion to his military superiors; the *punishment* of such a crime is altogether foreign to his station and profession. Still, both the threat and the actual infliction of punishment have often put an end to simulated madness. In a case which occurred in the navy, a sailor who evinced a great desire to throw himself overboard, but was for a time prevented, at length succeeded in doing so; immediately on reaching the water, however, he began to swim vigorously, and called loudly for a boat. Upon being taken on board, his madness had disappeared, and it did not return. The practice of former times would sanction a conjecture that this might be a case of real insanity cured. In the case of the girl mentioned by Fodéré, his informing the keeper in her presence that on the morrow a hot iron would be applied between the shoulders if she was not better, was immediately followed by great amendment. Actual punishment has often been advised, and even employed, where there existed merely suspicion of imposture; and, although condemning the practice, we must admit that it has frequently been successful in detecting deceit. Zacchias relates a case in which a physician recommended corporal punishment, on the principle that, if the madness were simulated, the cheat would not stand the test, and if it were real, the flagellation would do good as a derivative; and the event proved the accuracy of the first opinion. (Fodéré, p. 460.) The same means, however, and others equally severe, have often been employed without such a fortunate result, in equally suspicious cases. Examples of this sort, we have reason to know, were by no means extremely rare in the army and navy, during the late war. A melancholy instance of real insanity treated as feigned is related in Mr. Marshall's Hints to young medical Officers (p. 140); and we could enumerate others of a similar kind which occurred in the navy.

Some cases have come to our knowledge where deception was believed and punishment inflicted, yet, in which evidence of the reality of the disease was most conspicuous. In one of these, which occurred on board H. M. ship ———, two circumstances ought at once to have opened the eyes of the surgeon, viz., the periodical recurrence of the affection, and the total sleeplessness that prevailed during the paroxysm. They were also, we suspect, much less uncommon in civil life formerly, when the execution of the laws against vagrants was more summary than at present.

In this, as in all other feigned diseases, impressing the impostor with the hopelessness of his attempt to succeed in gaining his object, will be found the most effectual means of putting an end to the simulation. A few words intentionally dropped in the patient's hearing, but as if incidentally, expressive of the expectation entertained by the medical attendant that the case would be cured, and of intended perseverance in the treatment then pursued, have often proved prophetic. We have known instances of a stop being almost immediately put to simulated madness, by sending the soldier to the depôt for the insane.

It is fortunate that the very treatment most suitable to the recovery of persons really deranged is that which is most intolerable to the impostor. None but the most determined characters will be long able to resist the horrors of solitary confinement, bread and water, and the constant pain of blisters and other counter-irritants. Seclusion is particularly necessary in all such cases, as nothing tends so much to keep alive the hopes and the courage of the impostor as the consciousness that his raving is heard by his fellows, and the belief that an impression favourable to his views may be made on the minds of his officers, by the continued exhibition of his miserable state.

30. **Malformation.**—Deformity, such as curvature of the spine, elevation of one shoulder, shortness or distortion of a limb, inversion of the feet, &c., are occasionally simulated by soldiers, and sometimes with so much success that they obtain their discharge on that account. It may be said that a man who feigned deformity would readily be exposed by a medical practitioner who is intimately acquainted with the healthy configuration of the human body. This opinion seems to be well founded, yet cases occasionally occur from which it would appear that a simulator of deformity is not easily detected. We are acquainted with more than one instance where a board of medical officers have recommended recruits to be discharged from the army on account of alleged great deformity, but who were, in fact, remarkably handsome well-made men, and afterwards enlisted and were approved for service.

31. **Needles in the Body.**—Among the various factitious disabilities, induced or voluntarily

submitted to by patients, the singular one of the introduction of needles into some part of the body deserves particular notice. The two following cases will point out the character of this affection.

In July, 1818, a young woman was admitted into Richmond Hospital, Dublin, on account of a painful swelling of the left hand and arm, somewhat resembling that which occurs in phlegmasia dolens. The inflammation continued to increase, diarrhœa supervened, and her general health became greatly impaired from the constant pain and irritation of the disease. Amputation was performed close to the shoulder-joint, on the 21st of September. On examining the arm, eight or nine needles were found in the palm of the hand and forearm. The cause of the inflammation was now evident. This woman eventually confessed that she herself introduced the needles into her hand and arm, and she would assign no other reason for so doing but that she was tempted by the devil. An unwillingness to labour so as to procure a livelihood seems to have been the efficient cause of her exciting inflammation for the purpose of being admitted into an hospital. For several years after her arm was amputated she was employed in Richmond Hospital as a servant. (Phrenological Journal, vol. ii.)

The case of Rachel Hertz is perhaps still more remarkable. At about the age of fourteen, on the 16th of August, 1807, this woman became a patient of Professor Herholdt of Copenhagen. From this date until February, 1819, she suffered under a variety of anomalous complaints, and especially an affection resembling hysteria, or epilepsy, or both. About this time a tumour appeared near the umbilicus; and being opened, a needle was extracted from it. From the 12th of February, 1819, till the 10th of August, 1820, a period of eighteen months, this woman had a number of abscesses formed in different parts of the body, from which two hundred and ninety-five needles were at different times extracted. Her superior and inferior extremities became paralytic, and continued so for a long period; but she eventually recovered. Swellings, or abscesses, containing needles, continued to appear from time to time; so that from the 28th of May to the 10th of July, 1822, one hundred were extracted, altogether amounting to three hundred and ninety-five. It was supposed by Professor Herholdt and Dr. Otto, that she had swallowed the needles during her paroxysms of hysteria or epilepsy; but the truth was ascertained in a very simple manner. A young girl was observed in the act of introducing needles under the skin of her arm; and being asked who had taught her that trick, her answer was, that she had seen Rachel Hertz introduce needles under her skin.

32. **Ophthalmia.**—Factitious ophthalmia is, we believe, rare in civil life. It was very frequent among the French conscripts during the late war; no fewer than twelve per cent. of the inefficient conscripts belonging to the department of the Seine, during a period of ten years, were rejected on account of "impaired vision—diseases of the eyes." During the first ten or fifteen years of the present century, inflammation of the eyes prevailed to a great extent in some regiments of the British army, and there is much reason for supposing that factitious ophthalmia was then frequent. The following is one of the most extensive instances of factitious ophthalmia that has come to our knowledge. In the year 1809, three hundred of the men of two regiments which were on duty at Chelmsford, became affected with ophthalmia. The healthy men of the corps were removed to another station, and the sick remained in hospital, but under military command. Information having reached their commanding officer that one of the nurses of the hospital was in the habit of going to a druggist's shop for the purpose of purchasing medicines, suspicions were excited; and in conjunction with the medical officer in charge of the hospital, he made a successful attempt to discover whether the men had any drugs in their possession which might be employed to excite inflammation of the eyes. Accommodation having been provided for about twenty-four men, the number contained in one ward, at midnight the officer made his appearance in the hospital; the men were roused from their beds and forthwith marched in a state of nudity to the new ward. The old ward was secured for the night; and next day when the beds were examined, a number of small parcels of corrosive sublimate were found concealed. Means were taken to prevent a supply of this article, and in a very short time two hundred and fifty of the men had recovered, and were then marched to their respective corps.

The means that have been known to be used by soldiers to produce ophthalmia, besides the above, are powdered alum, snuff, salt, lime, tobacco-juice, &c.; also, mechanical irritation of the eye by hard bodies, extraction of the eye-lashes, &c. Presumptive evidence is, in general, all that can be obtained respecting the production of this disease; but many circumstances are calculated to excite suspicion in the situations where it is likely to exist. Among soldiers it has been found that the *right* eye has suffered chiefly, because this is the important organ to a modern man of war. The extreme rapidity of the progress of the inflammation in the factitious ophthalmia is often a guide to the real nature of the disease: it sometimes reaches its acmé in a few hours, a circumstance never observed in the natural disease. It is much more difficult to detect the disease in a chronic state. It is not improbable that the destruction of the eye among soldiers has been promoted by the large pension which government has allowed to those who are discharged on account of impaired vision. Formerly every man who became blind of one eye was discharged and received a pension for life of ninepence per day. This usage is, however, amended in the new pensioning warrant; for it is there ordered that "no soldier shall be discharged for the loss of one eye, whether it be the *right* or *left*." This regulation, if put effectually in execution, will in all probability lead to a great diminution of the prevalence of ophthalmia in the army.

When the disease is once detected, the cure of it is obvious; but much difficulty is often experienced in putting an end to it where it is merely suspected. When perfect seclusion cannot be obtained, as in the navy, a strait-waistcoat has been used to prevent the patient tampering with his eyes. (*Hutchinson*, loc. cit.)

33. **Pain.**—There is perhaps no morbid affection more frequently feigned than this; among the disabilities assumed for the purpose of obtaining a mere temporary object, there is certainly no one so often met with. It is the usual resource of the worthless and mean-spirited among soldiers, sailors, and slaves, to obtain a few days' respite from labour. The vulgar see little in real disease but pain, or they at least look upon pain as the common symbol of disease, which they regard as something superadded to and existing separately in the body. They constantly describe any chronic ailment as an entity; "it goes here, it flies there, it works in the bowels," &c. These flying or migratory pains are very common among soldiers and sailors, and are known by the cant name of "*the all-overs;*" they are readily detected by a little art. If the surgeon listens attentively to the narrative, and begins to catechise his patient with apparent simplicity and good faith, he may bring him to admit the existence of any symptom however absurd, and thus to betray himself.

By the more cunning and more resolute the existence of severe pain, fixed in some particular spot, is feigned with more success, and often indeed with astonishing constancy. Many instances are recorded, and several have come to our own knowledge, where individuals have supported their assumed character for a long period, under every privation and much real suffering. A remarkable case of alleged pain in the mamma, in a female mendicant, is related by Lentin, (Beytraege zur ausubenden Arzneywissenschaft, Leipz. 1797,) which could only be admitted as feigned on the clearest evidence. This woman went so far as to solicit, and at length to obtain, the amputation of first one mamma and then the other; and, not content with this, she afterwards wished one of her hands to be amputated on account of a similar pain, of which she alleged it to be the site. This woman was proved to be an impostor in respect of part at least of her alleged maladies; and she was considered by Dr. Lentin and other competent judges as equally so in regard to the pain. The following cases related by MM. Percy, Laurent, and Fodéré, are remarkable examples of the same kind.

A young man having been deceived by a recruiting officer, who promised that he should be made an ensign on his joining the regiment, formed the resolution of attempting to obtain his discharge by simulating disease. He complained of having a deep-seated pain in the left knee-joint, on account of which a great variety of remedies were applied, including blisters and moxa. The leg became by degrees extenuated, and he was sent to the baths. At last, after being four years under medical treatment, he obtained his discharge. Upon leaving the hospital, some of his comrades accompanied him a little way on the road, whom he treated with wine; and before they parted he took off the wooden leg he had worn for three years, and threw it into the fire, saying, at the same time, "they deceived me, and I in my turn have deceived them."

A soldier came under Fodéré's care in the hospital of Martigues, complaining of a violent pain in the left leg, which he represented as arising from his having slept on the damp ground. During a period of eight months the most severe and painful external applications were made, and medicines given internally without effect. He still continued in bed, being unable, as he said, to stand. The leg having become wasted from the repeated use of blisters and issues, and apparently shorter than the other, and he being moreover pallid and emaciated in consequence of the severe regimen to which he had been subjected, Fodéré at length obtained his discharge. While waiting for this, however, he was one day detected marching without any assistance, and, being taken up, at last acknowledged the imposition. (Op. cit. p. 473.)

Pains are also frequently feigned in the internal cavities of the body; and probably these may often be more easily detected than such as are alleged to have their site in the external parts, inasmuch as pains of a simply nervous character are perhaps of less frequent occurrence in the former situation, and pain depending on other causes will be accompanied by other appropriate symptoms. Still it must be admitted that detection in cases of this kind is more likely to be obtained through means of collateral evidence than by the absence of positive and sensible indications of disease. Every experienced practitioner has witnessed cases of most severe pain in almost every part of the body in persons who could not be suspected to feign; and the whole history of that great and increasing class of diseases termed *Neuralgiæ* is but a melancholy testimony in favour of the possibility of real pain being unmarked by any certain external signs. Too often, we fear, has the absence of symptoms in such diseases been the cause of great additional suffering to the victims of neuralgia in the public service; and we cannot more emphatically impress on the mind of the young medical officers in the army and navy the necessity of caution in such circumstances than by relating the following cases.

A young soldier, under the care of Fodéré, complained of violent pains in various parts of his body, now in one limb, now in another, in the chest, head, &c., unaccompanied by any other symptom. Considering these pains as fictitious, Fodéré refused to give the man his discharge; but he nevertheless died in the hospital without any new symptom. "After his death," says Fodéré, "I anxiously explored, by means of the scalpel, all the old seats of the pains, but could discover nothing, in the membranes, the muscles, the nerves, or the viscera; and I was forced to believe that life had been destroyed by the long continuance of the pains. Since then," the author adds, "I have often preferred rather to be too lenient than to run the hazard of being again unjust." (Méd. Légale, t. ii. p. 471.)

A seaman on board one of His Majesty's ships applied to the surgeon, complaining piteously of a pain in his shoulder preventing the motions of the arm. He could assign no cause for it, alleging that it came of itself and gradually increased to its present violence. No external mark could be discovered, and it being suspected to have arisen from some slight strain, it was ordered that the part should be rubbed with a common lini ment. This was continued for a fortnight without relief; blisters were then applied and kept up for another fortnight. There still appearing no external sign of disease, the surgeon, suspecting imposition, ordered the man to move his arm before him. The poor fellow hesitated, and, begging to be spared, was allowed to rest for a few days, when the arm was forcibly moved by another person. It was in vain that the man entreated them to spare him; the surgeon, confident in his fancied knowledge, and resolved to punish what his nosology told him was imposture, ordered a rope and a weight of eighteen pounds to be brought; he was commanded to swing the one, or to bear from the other the punishment which his alleged *crime* deserved. He implored, he hesitated; when the rope, laid on with no slight hand on his shoulders, made him seize the weight; but scarcely had he freed it from the deck when he was forced by pain to throw it down. This scene was exhibited for some time, and sullen resentment at length getting the better of patience, gave additional force to the surgeon's opinion. The man was about to be returned to his duty, and to be punished as an impostor, when a fatal evidence appeared to testify against the sentence of his cruel and ignorant judges: a slight swelling showed itself on the part with signs of fluctuation; it was laid open, and purulent matter, to the extent of nearly two pounds, was discharged! In this case, which we know to be authentic, ignorance was as conspicuous as barbarity. Such a scene could hardly occur in these days, and we heartily trust it never may in those which are to come. (See Med. and Phys. Journ. for January, 1808, vol. xix. p. 1.)

34. **Paralysis.**—Palsy is frequently pretended among mendicants, and it is also occasionally feigned in the army and navy. The pathognomonic symptoms of palsy commonly involve some organic alteration, which it is scarcely possible for a man to simulate with success if his case be carefully investigated by well qualified persons. The fact, however, that impostors have been successful, is a sufficient warning to medical practitioners to devote much attention to the examination of doubtful cases. Coche, a French surgeon, who has given much of his attention to feigned diseases, says, "la simulation de cette maladie (palsy) n'est que ridicule;" but experience has proved that, however ridiculous, it has often been successfully practised. Dr. Cheyne mentions several cases of this kind, in two of which the pretended paralytics evinced ludicrous proofs of their still possessing the use of their limbs immediately after they had succeeded in gaining their discharge. It ought always to be considered a very suspicious circumstance in a soldier or sailor if the loss of power is confined to a single limb, as the arm, as such a form of paralysis coming on in adults is extremely rare. In a case detected by Dr. Cheyne, his opinion of the disease being feigned was chiefly founded on the following considerations · because there coexisted no other signs of disease; because the countenance indicated health and intelligence; because the function of the brain was undisturbed, and all the senses were entire; because paralysis of the arm is a complaint frequently feigned by soldiers, but very rare in reality.

Feigned paralysis has been frequently detected by subjecting the patient to a powerful electric shock. A case occurred in the New York state prison which resisted all medicines until this remedy was tried. Upon receiving the shock the patient jumped up, ran into the hall, and asked for his discharge from the hospital. (Dunlop's Beck, p. 12.) Mr. Hutchinson detected an imposition of this kind in a sailor, by administering a dose of opium to the patient, and then tickling his ear during sleep; to relieve the irritation "the paralysed hand was instantly raised to the ear, which he rubbed with no small degree of force, and then turned round upon his left side, dragging the bed-clothes over him with his heretofore useless arm." Of course the discovery was complete. The editor of the journal in which Mr. Hutchinson's essay first appeared mentions a similar case in a soldier detected by the same means: in this case the sound arm was previously bound down to the side, under pretence of thereby benefiting the disabled limb. (Med. and Phys. Journ. liv. p. 93.)

Shaking palsy is simulated chiefly by mendicants. When the general health appears to be good, little attention need be paid to the shaking. For the diagnosis of this disease see the article Paralysis.

35. **Phthisis.**—It could scarcely have been imagined *à priori*, that a disease like phthisis, attended with such a complexity of symptoms, and marked by such conspicuous alteration of the external parts, would have ever been chosen as a subject of the malingerer. The following extract from Dr. Cheyne, however, will show that this has really been the case; and as this form of simulation has never come under our view, we shall content ourselves with the remarks of this excellent observer:—"The soldier, not content with representing one feature of consumption, will often undertake a perfect portrait of that disease, and this he will sometimes execute with great cleverness. The thought would seem to strike him while in the hospital under treatment for catarrh, or recovering from fever accompanied with pulmonary irritation. His cure all at once seems suspended; his food, he says, *stuffs* him, and he begs to be replaced on spoon or milk diet; he coughs much at the period of the daily visit; he suppresses his cough for some time previously, so that if there is any defluxion, it may be expectorated at that period. He expresses a wish to be let blood or blistered for a pain of the chest; begs for some medicine to relieve his cough; applies for a furlough; in short, so well does he act his part, that unless the surgeon is very circumspect, he will discover, when too late, that he has been made a dupe of. (Loc. cit. p. 160.)

It is needless to observe that a thorough acquaintance with all the phenomena of the real disease will enable any one, who is on his guard, to detect an imposition of this kind. Auscultation will be, in such cases, a most powerful, and frequently an infallible means of ascertaining the truth.

36. **Polypus of the Nose.**—This has been imitated by the matchless ingenuity of the French conscripts, by introducing the testes of cocks and hares' kidneys into the nostrils. (Percy and Laurent, op. cit.)

37. Pompholyx.—This affection of the skin is sometimes simulated by the application of blistering plaster. The imposture may often be detected by carefully examining the vesicles, as parts of the flies are apt to adhere to them. In a young woman who lately produced this affection in order to retain her comfortable position in an infirmary, this was the case; and, upon examining her box, small fragments of blistering plaster were found secreted.

38. Pregnancy.—An impregnated state of the uterus is sometimes pretended, to gratify the wishes of relations; to deprive a legal successor of his claim; to extort money; to obtain a remission of labour; or to delay the execution of punishment. A medical practioner, who has to give an opinion on a doubtful case of pregnancy, would require to make himself intimately acquainted with the signs of real pregnancy, and he ought especially to consult the best works on legal medicine. Auscultation promises to be the most successful means of discovering whether an alleged case of pregnancy be real or merely pretended. (See AUSCULTATION.)

Pregnancy is very frequently feigned by negro slaves in the West Indies with the view of obtaining ease; as masters are accustomed to indulge them, when pregnant, with repose from the severer kinds of labour. Besides the assumption of the sickness and other common symptoms of pregnancy, they place pads on the abdomen to deceive the sight. When they apprehend a discovery, they pretend that they have had an abortion, and often speedily re-commence the same course of deception. They know by experience that it is an easy matter to feign the early symptoms of pregnancy. A case of simulation of this kind, which was carried to a very refined pitch, was mentioned to one of the writers of this article by the gentleman on whose estate it occurred. A female, whose repeated alleged abortions had excited the suspicion of the overseer, and who was assured that nothing short of ocular demonstration would obtain belief, had the ingenuity to mutilate and prepare *a lizard* so as to deceive her cunning inquisitor. This imposition, however, was afterwards completely detected. These pretended *gravidæ* are occasionally locked up some months before the expected period of delivery; and instances have been known where they have remained confined for many months after this period has passed.

39. Prolapsus Ani.—This disease has been simulated by partially introducing into the anus a sheep's bladder or gut containing blood, leaving a portion externally to represent the prolapsed rectum. Ambrose Paré mentions a case of this kind; and the authors of the article in the *Dictionnaire des Sciences Médicales* another.

40. Rheumatism, Lumbago, &c. — This class of disabilities is frequently feigned by the members of benefit societies, and by soldiers and sailors when they wish to evade a particular duty or to procure their discharge. Rheumatism, when severe, is commonly marked by some functional derangement or organic alteration, which it is difficult to simulate successfully. With respect to soldiers and sailors they ought very rarely to be discharged on account of alleged rheumatism, &c. &c. unless in cases where there is an obvious organic change, such as great extenuation of a limb or nodosity of the joint. As in the case of simple pain, it is often difficult to discriminate these fictitious cases of rheumatism from the real disease. Still an attentive observer will in most cases be able to detect the feigned disease.

The following remarks by Dr. Cheyne on this subject are very judicious, and well deserving the attention of military and naval practitioners:—"Chronic rheumatism is distinguished by some disorder of the digestive organs, impaired appetite, a look of delicacy, a degree of pyrexia in the evening, yielding in the latter part of the night or early in the morning to perspiration. Some emaciation, wasting of the muscles of the affected limb, fulness of the veins, and puffy enlargement of the affected joint, take place. There is in general an increase of the temperature of the affected part. These symptoms are much influenced by the state of the weather, and they in some degree yield at length to proper treatment; whereas those who feign this disease usually retain their appetite and looks; have no diurnal return of fever, and no inflammatory symptoms. They give a glowing account of their sufferings, alleging that they have entirely lost the use of the part affected, which seldom happens in genuine rheumatism. There is for the most part no adequate cause assigned for the complaint; no relief from remedial treatment is acknowledged; and while real rheumatic affections are aggravated by damp, the impostor complains equally at all times." (Op. cit. p. 175.)

41. Short Sight. — This being a state of vision easily feigned, and, when real, incapacitating the subject of it for the duties of a soldier, is one of the most common disabilities pretended by unwilling recruits. It is also assumed by soldiers in order to obtain their discharge. During the operation of the French conscription, and particularly in the early part of it, before effective means of prevention were taken, short-sightedness was feigned to a singular extent by the young conscripts. In the department of the Seine, of every thousand conscripts who were exempted from service in consequence of disabilities, from the year 1800 to 1810 inclusive, fifty-eight were excused in consequence of being near-sighted. At last the alleged disability became so common that a law was passed forbidding men to be exempted on this ground; and all such persons were ordered to be employed as pioneers, hospital-servants, &c. Besides being assumed where it does not exist, this defect can be produced by the habitual use of concave glasses; and this practice was extensively adopted by the young men in France liable to serve. In short-sighted persons, the *crow-feet* wrinkles at the corner of the eyes are strongly marked, and there is an habitual frowning or knitting of the brows; but these signs are by no means unequivocal. The surest tests are enforcing the employment of concave glasses suited to the exact degree of imperfection assumed by the simulator, and putting him to read a book quite close to the eye. If able to read a book in this position *without* the glasses, and unable to read with the proper glasses at a corresponding distance, we may be almost certain that the disability is feigned. And yet even in this we may be mistaken. MM. Percy and Laurent mention a young schoolmaster, who, in expectation of being some day drawn for the army, practised reading with all kinds of glasses beforehand, and when he was drawn he obtained his exemption without difficulty. When any doubt is entertained regarding the existence of this defect, the most advisable measure is to follow the example of the French government, and place the individuals in situations where long vision is less necessary. This disability is rarely feigned by sailors, because, if real, it would not incapacitate them for the duties required of them.

42. **Somnolency.** — Occasionally persons allege that they are unable to undergo any fatigue, and sometimes that they are incapable of muscular motion on account of a constant and irresistible sleepiness. Dr. Hennen has recorded a most obstinate case of this kind. (Military Surgery.) Another case is detailed in the Edin. Ann. Reg. vol. iv. The subject of this case was a soldier in the Somerset militia, and only eighteen years of age. He had been confined for desertion. From the 26th April to the 8th July, 1811, he lay in a state of apparent insensibility, and resisted every means which it was deemed advisable to attempt for the purpose of rousing him. These means consisted of thrusting snuff up the nostrils, electric shocks, &c. &c. It was at last conjectured that the torpidity might be owing to a fall, whereby his head might have been injured, and the operation of dividing the scalp was performed for the purpose of ascertaining whether there was not a depression of the cranium. The requisite incisions were made, the scalp was drawn up, and the skull examined without a word of complaint. When the instrument destined to scrape the bone was applied, he once, and only once, uttered a groan. As this case seemed to be hopeless, the man was discharged and conveyed to his parents. Two days afterwards, he was seen two miles from home, cutting spars, and carrying reeds up a ladder.

The following case of feigned somnolency, or loss of sense, is a good example of the obstinacy with which the symptoms of disease may be simulated for the purpose of avenging an injury, or to obtain unjust compensation. A clergyman hearing his wife and servant-maid disputing in the kitchen, went below, and interfered so far as to repel some rudeness offered by the girl to her mistress, which he did by pushing her to one side. The girl fell against the dresser, either by accident or design, whereby she received a slight contusion over her eye. She then ran to the street-door, and told the people that she had been almost murdered by her master; and to corroborate this assertion, she fell apparently into an epileptic fit. Shortly afterward she was conveyed, as one expiring, to an hospital, and the clergyman and his wife were dragged to jail. The windows of his house were broken, his furniture was thrown into the street, and an account of the dreadful murder cried over the whole town. The girl lay for ten or twelve days without showing the least sign of sense or recollection. Mr. Dease having been called into consultation, soon detected the imposture, and the woman almost immediately disappeared. The terror and shame of being so publicly exposed made such an impression on the mind of the clergyman that his life was brought into the most imminent danger, and the expenses attending his confinement greatly injured his fortune. (Dease's Remarks on Medical Jurisprudence.)

Somnolency is, however, a real disease, and may originate without any obvious cause as a symptom of other diseases, or from external injury. Persons whose minds are alienated will frequently remain in bed for several weeks together in a semi-comatose state, resisting every argument and entreaty. This fact, and the following histories of real somnolency, will teach the medical officer to be extremely cautious in pronouncing any such apparent affection to be simulated.

Rudolphi, when in Milan, in 1817, witnessed the case of a journeyman book-binder, nineteen years of age, who was affected with a curious sort of sleepiness, in some degree resembling intoxication. In Rudolphi's presence he fell asleep, although he still continued to fold sheets along with the other workmen. His eyes were shut, and when it was wished to excite his attention, a loud knock was given on the table, by which he was awakened, and then he answered questions. The voice of one of the workmen, who was his friend, excited his attention, even when the tone was low. Upon being partially roused, he looked about with his eyes half open, and seemed to be aware of what was going on around him; for example, when a sheet was purposely folded wrong and given to him, he appeared to be displeased. He wrote a note in Rudolphi's presence. His comrades used sometimes to lead him about when he was asleep, and to make him play at billiards, &c.; but he did not recollect that he had been so employed after he awoke. When allowed to remain asleep for a few hours, he began to snore, nodding his head as many persons do when asleep.

A strong and active hussar, after many an ineffective effort during eight months to rouse him from a state of somnolent listlessness and inattention to his person and duties, was discharged from his regiment, being generally considered as a *skulker*. Being forwarded to Chatham, he came under the care of Dr. Burrell, of the 72d regiment, who, from an absence of every other symptom of disease, was at first led to adopt the same opinion. In the course of a week, however, some difficulty of articulation was discoverable, greater heaviness in his look and sluggishness in motion appeared, which in a few days ended in coma, convulsions, and death. On dissection, two tumours of a firm medullary structure were discovered, in contact with each other, one of the size of a pullet's, the other of a pigeon's egg, situated in the right hemisphere of the brain, and projecting considerably beyond its surface. (Dub. Hosp. Rep. vol. iv. p. 138.)

A seaman belonging to one of His Majesty's ships fell from a considerable height, and pitched upon his head: on examination, no fracture or depression could be discovered, the only mark of injury being a tumour of the integuments, which soon disappeared. From the moment of the accident, however, the patient exhibited symptoms of coma, inattention to surrounding objects, &c.; and he was therefore bled largely, purged, &c. The soporose state continuing without any other marked symptom, and there being discoverable not the slightest inequality of the bone, or other local indication of any injury beneath, the surgeon began to suspect imposition, and had recourse to the most vigorous counter-irritation, by blisters to the head, &c., partly on account of the painful impression produced by these means. This man at length was invalided, and on his way to England was seen by the gentleman to whom we are indebted for this interesting history, in the Naval Hospital at Gibraltar. At this time he lay in a listless semi-comatose state; rousing up when spoken to, opening his eyes and answering questions very rationally. A very marked symptom in this case was the incessant action of the left hand in alternate flexion and expansion, a symptom which had come on immediately after the accident, and had never since left him by day or by night. When the hand was restrained he seemed more uneasy, and as soon as it was disengaged the motions were resumed. He was sent to some of the naval hospitals in England, and his subsequent history is not known until he came under the care of Mr. Cline in May 1800, in St. Thomas's Hospital. At this time, says Sir A. Cooper, he was in a great degree destitute of sensation and of voluntary motion; his pulse was regular, his fingers were in constant flexion and extension. *He had a depression near the superior edge of the left parietal bone.* Mr. Cline trephined him, removing the depressed portion of bone, and the man gradually and completely recovered. (A. Cooper's Lectures, by Tyrrell, vol. i. p. 312.)

43. **Syncope.**—A most disagreeable part of the duty of the medical officer is to attend at the corporal punishment of soldiers and sailors. On these occasions it is not rare for the culprit to feign fainting, in the hope of having his punishment remitted; and the medical officer is sometimes called on to decide. In other circumstances, also, syncope is simulated by soldiers and sailors with the view of obtaining particular ends; and it is occasionally the resource of the mendicant to impose on the charitable.

Except in the extremely rare case of persons having a voluntary power over the action of the heart, there can seldom be any difficulty in discriminating the fictitious syncope from the real. The total suppression of the pulse, or its great diminution in point of strength and volume, the coldness of the surface and of the perspiration, the paleness of the countenance, cannot be assumed at will; and without these, the seeming exhaustion or alleged loss of muscular power will not impose on any person of experience. The state of the countenance alone suffices to indicate the real disease in almost every case.

It is hardly necessary again to inculcate on the mind of the young military or naval surgeon, that he must in all cases where the slightest doubt exists, take the side of mercy. It is better that he should be a thousand times imposed upon, than that a fellow-creature should be punished while labouring under a severe disease, to say nothing of the risk of death occurring if the syncope is real.

44. **Swelled leg.** (Barbadoes leg.)—Tumefaction of the leg is sometimes excited by soldiers putting a concealed ligature round the leg and letting the limb hang over the side of the bed during the night. There was a case not long since in Fort Pitt General Hospital, which was supposed by some of the medical officers nearly to resemble Barbadoes leg. This man had been sent home from India to be discharged. On admission into the hospital his thigh measured in circumference twenty-two inches and three-quarters, the calf of the leg seventeen inches and a half, and the ankle fifteen inches. Six days after the ligature had been discovered and removed, the thigh measured twenty inches, calf of the leg fifteen inches, and the ankle fourteen inches. Close examination will almost always detect the impression of the ligature in such cases, and the practice may be prevented by inclosing the limb in a box, or wrapping it in a marked bandage.

45. **Ulcers.**—The formation or irritation of ulcers by artificial means has been in all ages a fertile source of successful imposition to that class of persons who live by exciting the compassion and charity of the benevolent. In former times the more cunning and less daring vagrants imitated ulcers by fixing certain foreign substances on the skin, such as dry, shrivelled leaves, part of the skin of a frog, and even pieces of flesh. A curious case is quoted by Fodéré from an old French surgeon, Pigray, of a young woman who presented herself to the king of France to be *touched* for a large open cancer of the breast, but which, although "le mieux simulé et contrefait qui se puisse voir," Pigray discovered to be a slice of *spleen* fixed on the mamma! (Fodéré, tom. ii. p. 486.)

The actual formation of ulcers has been much more practised, and in the compulsory military service of all countries has been often carried to a very great extent. This was particularly the case during the late war among the French conscripts, and in the army and navy of this country. The most common site of these artificial ulcers, indeed almost the exclusive site in the army and navy, is the leg, a place, no doubt, selected partly because their existence in that position effectually incapacitates the patient from military duty. These factitious ulcers are either formed entirely by art, or, which is the more common case perhaps, artificially aggravated into great and severe affections from slight sores occurring naturally, or from slight accidents. The means used to effect these objects are very various: vesicants, irritants, caustics, compression, friction, puncture, excision, &c. &c. Sometimes a portion of skin is cut out, and then some irritating substance, such as lime, arsenic, corrosive sublimate, tobacco, the skin of salted herrings, acids, &c. applied to establish the ulcer, after which it is kept up by milder kinds of irritation. Mr. Hutchinson says, that the use of mineral acids is most difficult to detect. There was an old woman, who lived contiguous to the recruiting depôt at Dublin, who had the credit of carrying on a great deal of business in this way among the recruits. Her applications appeared to be a mixture of quick-lime and soft soap. But one of the most approved methods of operating is the firm compression of a copper coin against the tibia; and we have reason to know that this was the most common practice in the navy. Copper has always enjoyed a great reputation as acting injuriously on the animal body, and it is probable that this reputation has been the chief cause of its being employed to produce or aggravate ulcers, although its main effect depends on the mechanical impression produced by it. Mr. Hutchinson once found, in dissecting the leg of a sailor, which he had amputated for extensive caries of the tibia, a half-penny imbedded between the muscles, "nearly three inches from the margin of the ulcer," and which the man confessed to have thrust into the ulcer nine months before. (Loc. cit. p. 88.) Friction with sand seems also to have been extensively employed to produce ulcers; a process termed in the flash language *"fox-hunting."* (*Dunlop*, in Beck, p. 8.) An experienced eye will readily distinguish between an ulcer of recent formation asserted to be old, and one really old; but it is not so easy to discriminate one of long standing, kept up by repeated slight irritation, from a natural ulcer. In some cases after the establishment of the ulcer, so refined has been the imposition that a blister has been applied *round* it, with the view of producing the red glossy appearance possessed by the cicatrix of ulcerated parts. But the most distinguishing difference is the ready curability of the factitious ulcers, when secured from the tampering of the patient.

When once a soldier or sailor is suspected of keeping an ulcer open, the obvious means of treatment are, seclusion if practicable, and defending the ulcer from injurious applications. The most common methods adopted by medical officers to effect this last object have been to seal the bandages, or to inscribe on them, after they are applied, coloured lines drawn along the limb in such manner that it would be impossible to re-produce them if the bandage were removed and re-applied. Even these precautions have not always been found sufficient. Some of Mr. Hutchinson's patients kept up mechanical irritation by means of pins thrust through the bandages. He was therefore under the necessity of locking up the whole limb in a wooden box contrived for the purpose, and this he found an effectual remedy.

46. **Vomiting.** — Some persons possess the power of expelling the contents of the stomach at pleasure, and thereby simulate disease of that organ. In 1828, a soldier was for about six months in the General Military Hospital, at Dublin, on account of supposed disease of the stomach, chiefly indicated by a frequent disgorging of his food. About the end of that period it was ascertained that, instead of losing flesh, he increased in weight, a circumstance which was considered conclusive evidence that he did not suffer under any material disease. He was forthwith discharged from the hospital, and we have ascertained that he afterwards performed his duty efficiently. Vomiting became epidemic in the hospital during the time this man was a patient, but it ceased as soon as he was returned to his duty. Percy, in his article on simulated diseases, in the Dictionnaire des Sciences Médicales, mentions the case of a drummer who for a long time deceived the medical officer of an hospital by ejecting the contents of his stomach. He could at pleasure regurgitate his food. In a quarter of an hour after he had swallowed soup, he used to return the whole, apparently with great pain and general distress. It was eventually discovered that he privately purchased solid food, particularly hard-boiled eggs, which he did not vomit, and the imposture was thus detected.

Mr. Hutchinson mentions a case of feigned, or rather of factitious vomiting in a sailor, which was produced by voluntary compression of the epigastrium. The vomiting returned periodically, and upon the cause being discovered, was at once prevented by securing the patient's hands. Mr. Hutchinson adds, that he is thoroughly convinced of the existence of this power in certain persons to excite vomiting by pressure on the region of the stomach whenever they please. (Loc. cit.) Dr. Cheyne says that vomiting is voluntarily produced by some persons by swallowing air and then eructating, in which process part of the contents of the stomach is brought up along with the returned air. (Dub. Hosp. Rep. p. 165.) We are, however, cautioned by this distinguished physician not to be too hasty in deciding on the nature of vomiting in suspicious cases, as he himself confesses to have been in one case deceived by a pretended vomiting, and in another to have considered a case of vomiting as feigned which eventually proved fatal.

47. **Wounds.**—These have often been feigned when they had no existence; have been greatly exaggerated when slight; and have been artificially produced by the patient or with his concurrence, in a very aggravated form.

a. Fictitious wounds.—The pretence of being wounded when uninjured, or of being severely wounded when only slightly hurt, has ever been the resource and refuge of the coward in the day of battle. This practice has even been carried to such an extent as seriously to affect military operations. Cæsar, in his account of the blockade of Utica, speaking of the wounded in a skirmish wherein the enemy were driven with great terror into their intrenchments before the city, says, "qui omnes, discessu Curionis, multiquê præterea, *per simulationem vulnerum*, ex castris in oppidum propter timorem se recipiunt. Quâ re animadversâ, Varus, et terrore exercitûs cognito, buccinatore in castris et paucis ad speciem tabernaculis relictis, de tertiâ vigiliâ silentio exercitum in oppidum reducit." (De Bell. Civ. lib. ii. 35.) In the official report of the capture of Tarragona by the French, in 1811, Count Contreras, the governor, complains of having lost a great many officers in the last defence by their having *feigned wounds*, in order to avoid military duty. (Courier, July 30th, 1811.) "I have many times known," says Northcote, "cowardly lubbers during action, come tumbling down the ladder with the most violent groans and complaints, though, at the same time, they have received little or no hurt, and all I could do or say could not prevail on them to make a second trial of their courage, nor go up again till the action was all over. Nay, I have been told by those quartered at the same gun, that some dastardly fellows have actually put their feet or stood in the way of the carriage, on purpose to be hurt, that they might have a plausible pretence for going down to the doctor, which I must own I have great reason to believe, having sometimes met with such contusions in the legs and feet, occasioned (according to their own confession) by the carriage, but at the same time so slight as was scarce worth mentioning;

though sometimes very violent, at other times there was scarce any injury or contusion to be perceived, notwithstanding the most grievous complaints of pain and uneasiness." (Northcote's Marine Practice of Physic.) Very distinguished men have had the meanness to simulate wounds. In one of his expeditions, Gustavus Adolphus is said to have pretended that he had received a contusion in the leg from a musket-ball, and, as a proof of the fact, exhibited a red spot on his leg and a corresponding blemish on his boot, which refused to receive the usual polish. (Hist. Sketch of the last Year of the Reign of Gustavus IV. of Sweden, p. 57.)

One of the writers of this article was requested to visit an officer for the purpose of examining a gun-shot wound, which he alleged he had received from the enemy in his left arm. Upon examining the site of the wound, no injury could be discovered, except an abrasion of the cuticle, about the size of a large pea. The injury seemed to have been occasioned by a pen-knife rather than by a bullet. Care had been taken to destroy the sleeve of the jacket, so that it was impossible to learn any thing positive regarding the alleged cause of the wound by examining the clothes. Officers have been frequently accused of feigning wounds or contusions after a battle with the view of having their names recorded in the Gazette, or for the more sordid purpose of claiming a pension.

In a case of feigned wound without loss of continuity, which came under our own notice, the man had stained the part to represent the purplish yellow hue of ecchymosis on the decrease, alleging that the contusion had been received some days previously.

b. Factitious wounds. Mutilation.—The infliction of wounds by the individual, chiefly for the purpose of mutilation, is a practice which has prevailed in all ages and countries where military service has been forcibly imposed upon men. Mutilation was a frequent practice among the conscripts of ancient Rome, more especially during the decline of the empire; and it would appear that it is from the most common species of mutilation among them, viz., by cutting off the thumb (*pollicem truncando*) that our modern word *poltroon* is derived. At first this sort of mutilation exempted the individuals from service; but afterwards the law was altered, and in the prescribed levy from any district, two maimed recruits were only reckoned as *one*. Soldiers who voluntarily disabled themselves were branded and still retained in the service. Mutilation was very frequent among the French conscripts during the wars of the Revolution and the Empire; and the same regulation was eventually adopted in France as among the Romans, viz., the retention in the service of all men whose mutilation could be proved to have been intentional. A species of mutilation very common among them was the extraction of the incisor teeth, or the filing them down below the gum, a condition of parts which prevented the soldier from biting off the end of his cartridge in loading his musket.

Mutilation has been very prevalent in the army and navy of this country; and the modes in which it has been effected have often been more than usually bold and severe. The wounds have frequently been inflicted during battle, or in a crowded barrack-room, with the view of giving greater plausibility to their alleged accidental occurrence. Frequently, however, more especially in the navy, the act of self-mutilation has been openly practised.

During the late war a naval officer went on board a merchant vessel at Yarmouth for the purpose of impressing seamen, and while on board said, jestingly, to a boy about ten years of age, that he would take him with some others; upon which the lad ran below, and immediately returned with one of the fingers of his left-hand cut off, exclaiming—"You can't take me now! My father cut off three fingers that he might not be pressed, and I have done the same!" A seaman in the Ambuscade cut off his thumb in the presence of his officers, in a sudden fit of anger and despair at being kept in the service at a time when some others were discharged; and several instances have come to our knowledge where seamen cut off the whole or greater part of their hands, with the avowed purpose of obtaining their discharge. Others, again, who have committed similar mutilation of their persons, have pretended that they were done by accident.

In many cases of mutilation the object of the men is two-fold,—to procure their discharge from the service, and to obtain a pension. The self-inflicted wounds of soldiers are most commonly produced by the musket, and they almost always pretend that they have been accidental. During the period of four years from 1824 to 1828, there were twenty-one soldiers pensioned in Ireland on account of injuries they had received in one of their hands by the explosion of their own muskets. Recent regulations in the army deprive soldiers of pensions who are disabled by such accidents, except they occur in the performance of military duty; and if the mutilation is proved to be intentional, the individuals are still retained in the service, although unfit for the ordinary duties of a soldier. Mutilation occurs in the army more frequently in the hands and fingers than in any other part of the body. In one regiment, however, where the practice became so far epidemic that nine cases of mutilation by the explosion of muskets happened in the course of six weeks, the lower extremities chiefly suffered. We have known a number of cases of mutilation occur among soldiers when they were on a visit to their friends; and little doubt could be entertained that the maiming was voluntary. The injury commonly occurred about one or two days before the expiration of the furlough.

Mutilation has been practised, but much more rarely, by parish paupers, with the view of obtaining immunity from labour. It has also occasionally occurred among slaves in the West Indies; but we have been told that their animal courage is seldom sufficient to prompt such bold measures.

There will rarely, if ever, occur any difficulty on the part of the surgeon in detecting the imposition in the case of wounds being alleged to exist when no wound has been received. In the case of self-inflicted wounds or mutilation, however, it will not always be easy to prove that they have been intentionally produced. The proof will rest sometimes on the nature of the wound, sometimes on the circumstances under which it is stated to have occurred, and sometimes on other collateral circumstances. In the case of a soldier or sailor it will often be a matter of great importance to the individual, that the decision come to is the true one; as it will frequently have the effect of obtaining for him his discharge from the service, and perhaps a pension, or of depriving him of both advantages, and perhaps entailing punishment also. In forming his opinion of the probability of the wound being self-inflicted, the surgeon will be guided by the consideration of the nature and extent of the wound, its situation, the nature of the alleged cause, &c. For instance, if the wound be of such a kind as renders it improbable that the patient either could or would have inflicted it; if it be of great extent and *more* than sufficient to effect the object the perpetrator may be supposed to have had in view,—if it be in a part of the body to which the patient's hands, or an instrument wielded by him, could not have reached, —the probability certainly is that it is accidental. On the other hand, if these circumstances are reversed, and if the mode in which it is stated to have occurred is improbable or impossible,—if the alleged cause or instrument is ill calculated or not at all calculated to produce the effect,—the surgeon will be more disposed to regard it as voluntarily inflicted. The examination of collateral circumstances will often afford more positive evidence than grounds of a merely medical kind. The following case affords an example of both kinds of evidence. A seaman on board one of His Majesty's ships lopped off two of his fingers with an axe upon a post, in the fore part of the ship termed *the manger*, and in the confusion of the moment left them there. He then ran down into the hold, and uttering a piercing cry rushed on deck, exhibiting his mutilated hand, and asserting that he lost his fingers by the accidental collision of two water-casks. Here the character of the wound sufficed to disprove the truth of the alleged cause;—no collision of casks could produce so clear a wound, or so complete an amputation; still more certain evidence, however, the man's own stupidity afforded; for shortly after his two fingers were found on the manger, and lying near them the axe which had divided them.

The improbability or even impossibility of a wound being inflicted by the patient himself, is, however, no certain proof that it has not been inflicted intentionally; since the unhappy men have been known, like the ancient Romans, to assist each other in the perpetration of this partial suicide. Instances of this kind have been mentioned to us both in the army and navy; the wounds being produced both by fire-arms and cutting instruments. During the late war we remember an instance of a father cutting off one of his son's fingers to prevent him serving in the militia. There was a young convict on board the hulk for boys at Chatham, not long since, who placed his right arm over a space between two beds, and got a companion to strike the forearm with a long piece of wood. Both the bones were thus fractured; and even after the arm had been put up in splints, he found means to displace the bones, and thereby prevented a perfect union.

[See a table of *feigned*, pretended, simulated or excited diseases or disqualifications in the writer's *Dictionary of Medical Science*, 4th edit. p. 303, Philad. 1844.]

In concluding this article, we cannot dismiss from our minds the possible impression it may leave on the minds of junior medical officers in the public service; whom we would guard, on the one hand, if possible, from suffering a spurious humanity to be detrimental to the interests of the army or navy, and, on the other, with even more anxiety, from the vain desire of acquiring temporary consideration by a stubborn and cruel incredulity, or by an affected shrewdness in detecting imposture where no imposture may exist.

There are cases mentioned in the preceding part of this article, which show, indubitably, that the simulation of disease has frequently been practised without the existence of any interested motive, indeed without motive of any kind; that there is, in short, a species of monomania of which this simulation is the characteristic. Such cases may occasionally be remembered with advantage.

But there is another consideration equally worthy of being entertained by all who do not wish the common feelings of a man to be lost in those of a mere disciplinarian. For notorious malingerers we are in no degree disposed to plead; but when instances of deception become *frequent*, in any country, in any garrison or station, in any regiment, or in any ship of war, the question may very reasonably present itself—is there not something wrong in the arrangement of the place, in the government or administration of the particular portion of the community in which such frequent deceptions are resorted to;—something which, acting injuriously on the bodies or the minds of the men, is therefore not beneath the consideration of the medical officers of the establishment, who alone can appreciate the mischief, and by whose mediation alone it is likely to be remedied? The privilege conferred by their profession, of being *the friends of mankind*, is one which ought not to be willingly resigned.

The negro-slave, and the conscript of an imperial conqueror, may be equally placed beyond the pale of such considerations; but the British soldier or sailor ought never to be so; even the convict is not shut out from mercy. The condition of both soldiers and sailors has, during late years, been much ameliorated; and deceptions are less frequent both in the army and navy than of old. These amendments in their condition have often arisen out of the representations of enlightened and humane medical superintendents. Wherever, therefore, we repeat, the instances of imposture are numerous,—wherever these manifestations of discontent are frequent among men whose general characters afford an assurance that in ordinary circumstances they would not prefer pain and privation to duty; the circumstances in which such opposite and desperate resolutions are taken, should undergo the most scrupulous and fearless investigation. Such a duty is enjoined by an authority higher than any temporary authority to whom its performance may happen to be disagreeable.

J. Scott.
J. Forbes.
H. Marshall.

FEVER.—The word *fever*, derived from the Latin term *febris* (a derivative of the verb *ferveo* or *ferbeo*, signifying *to be hot*,) is applied to a class of diseases characterized by morbid heat of skin, frequency of pulse, and disturbance in the various functions.

In the Greek language, the word *πυρεξία* (from πῦρ, *fire*,) expresses fever; hence the origin of the term *pyrexiæ*, under which the ancient writers comprehended *fevers* and *inflammations*, a classification which has been retained by modern nosologists. It therefore appears that upon one symptom alone, *increased heat*, the nosological distinction of a very numerous and important class of diseases has been founded. Though this characteristic feature is very generally observed, nevertheless in some cases of fever, strictly so called, the heat of skin is not above the natural standard, sometimes even below it; from this circumstance, therefore, it is evident that other phenomena are necessary to constitute a febrile disease.

We know so little about the cause of the generation of animal heat, that no satisfactory explanation of its increase or diminution in fever has been given: it seems probable, however, from some experiments, that its evolution is intimately dependent on the condition of the brain and nervous system, and until physiological investigations shall unfold with greater certainty the mode in which animal heat is generated, the pathologist must be satisfied with the ultimate fact, that in febrile diseases there is generally, among other phenomena, increased heat.

There are some diseases, the symptoms of which are so characteristic, and so invariably present, that there is little difficulty in determining their precise nature and seat. The various organic inflammations — of the brain, lungs, intestines, &c.—are examples of this class: there are others of which the precise locality is either so varied or obscure, either as regards the symptoms during life, or, in many instances, on dissection after death, that we are unable to discover their nature. To this latter class fever properly belongs. It is true that in most cases of fever we can discover the existence of certain lesions, but these are too vague or indefinite to enable us uniformly to decide on the primary seat of the malady. It is more than probable that in what is usually called *idiopathic fever* there is alteration either of the solids or fluids, although its precise locality cannot in every case be detected; but without disease in either the one system or the other, we maintain that fever cannot exist.

It is too generally imagined that the primary disease which induces fever is essentially local inflammation. The application of this doctrine to the early stage of fever, we hold to be not only at variance with facts, but dangerous as to the practical deductions to which it leads. We know that irritation, far short of inflammation, is sufficient to excite feverish indisposition, more particularly at those periods of life at which the vascular system is easily excited by apparently trivial local or sympathetic disturbance, (for example, in infancy or childhood by dentition or intestinal irritation,) and that this feverishness disappears when the cause is removed. The paroxysm of an intermittent is induced by the peculiar effect of a malarian poison; in this disease, the whole phenomena of fever are well marked, but certainly few will maintain that the febrile disturbance is the consequence of local inflammation. There can be little doubt that the error alluded to may in a great measure be imputed to the attempts to discover the cause or nature of fever in the various local lesions which are observed in fatal cases.

On the other hand, the important fact should ever be kept in view, that the primary disorder, whatever it may be, passes readily into inflammation, and that the lesions which arise in the progress of fever constitute the principal source of danger, and are in many instances the more immediate cause of death.

If we trace the early records of medicine, we find that the nature of fever has afforded ample field for discussion from the time of Hippocrates to the present day. Both the solids and fluids have been investigated, and arguments adduced in support of the opinion, that a morbid condition of either the one system or the other was the cause of fever.

The ancients possessing a very scanty knowledge of anatomy, either in its healthy or morbid state, and the secretions being evidently vitiated in the progress of fever, it was natural that a morbid condition of the fluids should, in the early ages of medicine, be considered as its primary cause. The humoral pathology was accordingly received as the only explanation or theory of fever, for many centuries. We find the early medical writers entertaining the idea, that the system waged war against something noxious within itself, and that in the attempt to expel the offending agent, a violent commotion was excited. By this plausible theory, the duties of the physician were restricted to assisting nature in her efforts to get rid of what was deemed injurious to the welfare of the body: in fact, fever was imagined to be a natural and salutary process, indispensably necessary to throw off whatever was noxious, whether generated within the body, or introduced by external causes. Some theorists, in their anxious desire to support this doctrine, endeavoured to deduce the term fever from the Latin verb *februare*, signifying to purge or purify, and by those who implicitly believed in this theory, the derivation was no doubt considered apt and appropriate. The application of the doctrines of the humoral pathology in explanation of the phenomena of fever, received much apparent confirmation from the circumstance, that in eruptive fevers, after more or less febrile disturbance, various eruptions appear on the skin. It was rendered still more imposing, when the chemical doctrines of Paracelsus and Van Helmont were first promulgated. These chemical philosophers imagining that in fevers the fluids possessed at one time an alkaline, at another an acid quality, conceived that an effervescence took place, which gave rise to a febrile paroxysm—an assumption which led to not a few fatal practical errors.

The idea that particular forms of fever depend on a morbid state of the fluids has been maintained by many pathologists in more recent times. The vital fluid has been subjected to chemical analysis with the object of ascertaining the comparative difference in its component ingredients during fever: these researches tend to show, that previous to the attack, the blood is materially altered in its properties, and that its constituent principles undergo progressive changes, as the disease proceeds.

This department of chemical pathology has been lately much elucidated by the experiments of Dr. Cluny, detailed in his published lecture on typhus fever, and also by the observations of Dr. Stevens, who states that on opening the heart in fatal cases of yellow fever, he found, instead of blood, a dissolved fluid nearly as thin as water and black as ink. In both sides of the heart the fluid was equally black, and throughout the vascular system all distinction between venous and arterial blood was completely lost. Dr. Stevens supposes that when the blood is found in this state, it is entirely deprived of its stimulating properties, and therefore unable to excite the heart or to support life. It is affirmed, also, that the changes in the blood take place in a certain determinate order. It first loses its solid parts and becomes thin; it is then deprived of its saline principles, and becomes black and vapid; and lastly, from its preservative elements being destroyed, it loses its vitality so as to be incapable of supporting life.

Dr. Stevens considers this diseased state of the blood as the first link in the chain of the morbid phenomena which constitute fever. He believes that the aerial poisons from which all pestilential diseases arise are attracted with the atmospheric air into the circulation, mix directly with the blood in the pulmonary system, and that this poisoned or diseased state of the whole circulating current is the cause of the subsequent morbid action in the solids. Similar views with respect to the pathology of fever are gaining ground in France, in which country the doctrines of solidism have almost exclusively prevailed.

The study of the structure and functions of the human body, in its healthy as well as in its morbid state, being the most satisfactory method of investigating the nature of disease, and lesions having been discovered in various organs of those who have died of fever, the attention of pathologists has in later times been directed to the state of the solids, in hope that the origin of fever might be discovered.

The locality of the disease, however, has been most warmly disputed; indeed there are few organs of the body which have not been fixed on as the seat of fever; from which it may be inferred, that the doctrines of solidism are as little likely as those of the humoral pathology, to explain every variety of this inscrutable disease.

The functions of the brain being almost invariably affected in fever, it was to be expected that the solidists would endeavour to trace its origin to the nervous system. We accordingly find, that towards the close of the seventeenth century, Stahl maintained that the phenomena were the result of a general commotion in the system, in its endeavour to throw off a spasm induced by torpor of the brain and nervous system. This explanation, which, after some modifications, was adopted by Hoffman, was the first attempt to assign to the brain an important share in the pathology of this disease. It formed the basis of the theory invented by Cullen, who believed that in fever certain causes produced collapse or diminution of the energy of the brain. The effect of this on the voluntary muscles and the extreme vessels was universal debility, and spasm or constriction of the capillaries: the subsequent re-action of the sanguiferous system, however, had the effect of resolving this supposed spasm, and consequently removing the fever. The prominent importance the Edinburgh Professor assigned to the fictitious debility which was imagined to result from this unknown condition of the brain, notwithstanding his theory that there was an inherent protective power in the system by which this fancied weakness was to be overcome, has been followed by serious practical errors, by abstracting the young and inexperienced mind from the more acute forms of fever, and from those important local complications which very frequently take place in its progress. Besides, as Dr. Parr has remarked, in this system the production of spasm by debility is an isolated fact without a support, and the introduction of the *vis medicatrix naturæ* is the interposition of a divinity in an epic, when no probable resource is at hand.

It is evident that in the definition of fever given by Cullen in his nosology, he expressly discountenances the idea of primary local disease; consequently he only partially adopted the doctrine of solidism, his theory merely implying that the various exciting causes act primarily on the brain.

This doctrine prevailed not only in British but in many continental schools, till Dr. Brown, evidently to gratify a feeling of resentment, opposed it with great bitterness. He invented and publicly propounded with much plausibility an opposite theory, which had the merit of great simplicity. According to Brown, the living system is an organized machine endowed with an inherent principle of excitability, arising from a variety of internal and external stimuli, and from which the excitement which constitutes the life of the machine is maintained. Upon these principles he founded the character and mode of treatment of all diseases, which were supposed to consist but of two families, the *sthenic* and the *asthenic;* the former produced by accumulated, the latter by exhausted excitability, and marked by indirect debility. The remedial plan was as simple as the arrangement. Bleeding, low diet, and purging were employed to cure the sthenic, and stimulants, of various kinds and degrees, the asthenic diseases.

Fevers, therefore, under this hypothesis, like other diseases, are either sthenic or asthenic, as they are the result of accumulated or of exhausted excitability. This doctrine obtained but few adherents in the British schools, though, as we shall presently notice, it prevailed extensively for a time in several parts of the continent, more particularly in the north of Italy.

Another class of solidists asserted that inflammation of the brain was the cause of fever. Ploucquet, who appears to have first taken this view, admitted, however, that from particular circumstances, other organs became occasionally implicated. Though this theory evidently implied that fever was dependent on local inflammation, it gave the disease a wider range—it assumed inflammation of the brain to be the source of fever, but that from the operation of certain causes, other irritations were in some instances superadded. Marcus and Clutterbuck have subsequently adopted this view, and have severally adduced arguments in its favour. Admitting, however, that the various exciting causes of fever do in some instances exert their action on the brain, we have no evidence that they produce, in the first instance, inflammation in this organ: on the contrary, the symptoms denote that the nervous system has only received a peculiar and powerful impression. When, on subsequent re-action taking place, a general impulse is given to the circulation, and the nervous system is roused from its depression, inflammation of the brain does frequently take place, especially in young plethoric subjects, just as it may supervene in any other organ to which, from causes hereditary or acquired, the individual may be predisposed. It should also be impressed on those who are inclined to adopt this doctrine, that although in a considerable proportion of persons who die of continued fever, the membranes, and frequently the substance of the brain, bear unequivocal marks of inflammation, yet such morbid appearances are by no means invariably observed.

We are next to advert to the doctrine which ascribes the phenomena of fever to primary affection of the intestinal canal. Lesions of the intestines in fatal cases of fever had been long ago pointed out by those who devoted much attention to the study of morbid anatomy. Bonetus stated that on dissection of persons who died of malignant fever, he found the stomach and intestines inflamed. Bartholinus made a similar observation; and in the works of Sydenham, allusion is made to ulceration of the intestines in continued fever. Subsequently Rœderer and Wagler (De Morbo Mucoso, Goettingæ, 1762) published a description of an epidemic mucous fever which prevailed at Gottingen, in which the appearances which were found after death in the alimentary canal are minutely detailed.

From these statements, it appears that the morbid appearances in the alimentary canal had attracted the attention of pathologists long before the promulgation of the theory in France, that fever was the result of inflammation of the mucous membrane of the intestines. This view, which was first maintained by Broussais more than twenty-five years ago, has become the prevailing opinion in France, though it has gained comparatively few proselytes in other countries. (Examen des Doctrines Médicales et des Systèmes de Nosologie, &c. Par F. J. V. Broussais. Prop de Méd. cxxxviii. cxxxix.

Those who maintain the physiological doctrine of Broussais, contend that fever is entirely symptomatic of irritation or inflammation of the mucous membrane of the intestines. The leading principle of this theory is, that every irritation which is capable of producing an impression on the brain is reflected by this organ on the mucous membrane of the bowels. Broussais applies it to other acute diseases; for instance, in small-pox or measles, the inflammatory excitement by which they are accompanied is supposed to be first conveyed to the brain, and afterwards reflected on the mucous membrane of the intestines, and that thus inflammation (gastro-entérite), the supposed cause of these eruptive fevers, is produced.

It is affirmed that inflammation and its consequences are invariably found in the mucous lining of the intestines, on examination of persons who have perished from fever, and that the treatment which is founded on this view is the most successful. Broussais, indeed, asserts with unparalleled boldness, that the tables of mortality declare in favour of the new doctrine, and that its influence on the population would be more favourable than vaccination itself.

Though Rœderer and Wagler, Prost, (La Médecine éclairée par l'ouverture des Corps), Baillie, (Morbid Anatomy), and others, had previously detected morbid appearances in the bowels, in their dissections of persons who had died of fever, the theory of Broussais, that inflammation of the mucous membrane of the intestines is the cause of fever, had the effect of directing the attention of pathologists still more particularly to the condition of the intestines in this class of diseases. In 1813, M. Petit and M. Serres[*] published the account of a disease, very frequent in Paris in 1811, 1812, and 1813, which they called entero-mesenteric fever, and which was characterized by all the symptoms of continued fever, but originated apparently in certain changes in the inferior portion of the small intestines and ileo-cæcal valve, accompanied with enlargement and suppuration of the corresponding glands of the mesentery. The precise anatomical lesion of the intestines, however, was not ascertained by these laborious pathologists, but subsequently by M. Bretonneau of Tours,[†] who, after investigating the subject with great minuteness, came to the conclusion that the primary source of fever was in the conglomerated mucous follicles, or glands, situated in the lower portion of the ileum and solitary glands of the cæcum.

A most full and elaborate work has been lately published by M. Louis,[‡] in which the pathological views of Petit, Serres, and Bretonneau, as to the primary seat of fever, are confirmed. This author, moreover, has given a most minute account of the various secondary lesions which supervene on this supposed primary intestinal disease.

These views of the nature of fever now prevail almost exclusively among the French pathologists. Mild fever is supposed to arise from gastro-enteritis alone, the various forms which it occasionally assumes being regarded as gastro-enteritis, with particular complications. For instance, inflammatory or ardent fever (a form rarely observed) im

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[*] Traité de la Fièvre Entéro-Mesénterique observée, reconnue, et signalée publiquement à l'Hôtel Dieu de Paris dans les années 1811, 1812, et 1813, par M. A. Petit, l'un des Médecins du dit Hôpital, composé en partie par E. R. A. Serres, &c.

[†] Trousseau, de la Maladie a laquelle M. Bretonneau à donné le nom de dothin-entérite. Arch. Gén. de Med. x. 67. 1826.

[‡] Recherches Anatomiques, Pathologiques, et Thérapeutiques sur la Maladie connue sur les noms de Gastro-Entérite, &c. par P. Ch. A. Louis, M. D.

ports an intense degree of this lesion; the adynamic (typhus mitior) is regarded as gastro-enteritis which has assumed such a degree of intensity that the general powers decline, while the intellectual functions are more or less disturbed. The more malignant forms of fever (typhus gravior) are supposed to be gastro-enteritis complicated with irritation of the brain, from sympathy with the state of the alimentary canal; and when fetor of the breath, perspiration, and stools are observed, the disease becomes what has been termed putrid fever,—that is, putrid symptoms are superadded to the primary gastric inflammation.

It cannot, however, be conceded that in every form of fever this local disease does exist, as it has not been universally, nor even in the majority of instances, discovered on the most minute examination of the intestines in fatal cases. The more probable inference is, that this gastro-entérite, or follicular disease, occurs only occasionally, and that it is much more common in some places than in others. We know that it is observed more frequently in the fevers of France than in those of Britain; very rarely, if ever, in the epidemic fever of Ireland; and that it is only occasionally met with in the epidemic visitations in the northern districts of England and Scotland.

From its being observed in a greater proportion of cases in London and Manchester, it is probable that there are some local causes or circumstances in particular places, which produce this intestinal affection. Whether in those cases in which it has been found after death, (for we maintain that the pathognomonic or diagnostic symptoms by which it has been supposed to be indicated are by no means uniform or satisfactory,) it be the cause or effect of the febrile symptoms by which it is accompanied, is still a question about which there is great difference of opinion, though the majority of British physicians regard these intestinal lesions as only the sequelæ or consequences of fever.

[Of late years, many of the French, and some of the American, pathologists have maintained, that the intestinal follicular lesion, referred to above, is characteristic of one form of continued fever—the *typhoid*. To this view reference will be had hereafter. It is not uncommon in the United States. Dr. Bartlett (*History*, *Diagnosis*, and *Treatment of Typhoid* and of *Typhus Fever*, &c. p. 86, Philad. 1842) considers the *red-tongue fever* of Kentucky to belong to it.]

The assertion that the treatment founded on the gastro-enteritic pathology is the most successful, is only an assumption; indeed, it may be fairly inquired how many hundreds annually survive the treatment calculated to increase gastric inflammation — how many are daily stimulated with bark, wine, and ammonia, and yet recover? Besides, how can this doctrine be applied in explanation of the phenomena of intermittent fever? In France as well as in this country, periodic fevers are successfully treated by stimulants — bark, and even arsenic; not to allude to the complete suspension of the febrile paroxysm for twenty-four, forty-eight, seventy-two hours, or even longer.

These circumstances, when duly weighed, must in our opinion disprove the general conclusion, that every form of fever is the result of gastric inflammation. On the other hand, we are bound to admit the occasional existence (more frequent in some localities than in others) of the various intestinal lesions, which have been so minutely and elaborately described by the French pathologists, to whom, if this discovery be not entirely due, the merit must be conceded of having, with indefatigable labour, followed up the few hints which previous writers had thrown out, and thus brought to perfection one of the most important pathological facts connected with the morbid anatomy of fever.

The celebrated Pinel took a more extended view of the nature of fever than any preceding writer of the continental school. He distinguished symptomatic from primary or essential fevers, and comprehended under this latter class, acute diseases in which there is a quick pulse, hot skin, and disorder in the various functions, the symptoms being independent (as he supposed) of local disease. While he admitted, however, in his classification, the existence of fevers without primary disease in any organ, he evidently localised the varieties when he stated that the seat of inflammatory fever (*angeio-tenic*) was in the organs of circulation; that the origin of bilious fevers (*meningo-gastric*) was in the mucous membrane of the intestines; that a particular form of gastric fever (*adeno-meningeal*) depended on disease of the mucous follicles alone; that in another variety (*ataxic*) the brain and nervous system were chiefly affected; another type (*adynamic*) being characterized by great prostration or depression of the vital powers, and often complicated with symptoms which have been usually referred to putridity.

These views have been since partially adopted, and have evidently given origin to the doctrine entertained by a large proportion of physicians of the present day, that fever is an essential disease, that is, the symptoms are independent of primary organic lesion; though it is admitted that in the majority of cases, local inflammations become developed in its progress, and constitute the principal source of the severity or danger of the disease.

The doctrines of Brown, which had obtained, as we have stated, comparatively few converts in his own country, made a strong impression in the north of Italy. Rasori, who had visited the medical school of Edinburgh, was so enamoured with the Brunonian system, that, on his return to Italy, he published a compendium of this system, (to which the learning and ingenuity of Darwin had given a new impulse,) as well as a translation of the celebrated Zoonomia of Darwin.

A few years afterwards, however, a petechial fever appeared at Genoa, in which the stimulating treatment recommended by Brown was evidently so injurious, and positively fatal, as to induce Rasori to reconsider the theory. He then became convinced of its inconsistency and error, and ultimately acknowledged this conviction in an account which he published of the epidemic of Genoa. (Storia della Febre Petech. di Genoa. Del Prof. Giovanni Rasori.) This epidemic, from whatever causes it arose, had many of the characters of what Brown termed an *asthenic* disease, and was consequently treated by stimulants. From the numbers who perished under this plan, and from observation of its symptoms and progress, during which local inflammations not unfrequently occurred, Rasori was induced to substitute a modified antiphlogistic, or, according to the language of the Italians, a *contro-stimulant* treatment.

Bloodletting in the commencement of the disease, when the patient was young and vigorous, and when the symptoms demanded it, was found decidedly beneficial; and in less severe cases, saline purgatives, antimonials, (more especially the tartar emetic in liberal doses) and acidulated drinks were employed.

These remedies, with blisters in the advanced stage, stimulating friction to the abdomen, with the view of allaying the gastric irritation, light bed-clothing, and rigorous diet, constituted the treatment employed in the epidemic.

This change of Rasori's opinions produced a considerable sensation, and had the effect of overturning the leading principles of Brown's system in Italy. The professors in the north of Italy, who were formerly attached to Brown's views, taught the doctrines of Rasori with some unimportant modifications, and ultimately several works emanated from the different universities, explaining the leading principles of the "Doctrine of Contro-stimulus," or, as it was afterwards termed, the "New Medical Italian Doctrine." As it would lead to digression, we must refer those who wish to obtain information on the Italian doctrines to the several works alluded to.[*]

Tommasini, whose learning and reputation rank him as a leading authority of the Italian school, considers fever to be the immediate result of a morbid condition of some internal organ; and in this he is followed by a large majority of the Italian physicians.

Others, however, adopt the views of Rubini, and ascribe the phenomena of fever to the effect of a contagious principle absorbed into the circulation, which, after producing inflammatory action, gives rise to symptoms indicating failure of the powers of the system. The antiphlogistic treatment is consequently pursued in the commencement of the fever, and afterwards a stimulant plan, when the powers of the system appear to give way.

The doctrines of Broussais have obtained an inconsiderable number of adherents in Italy, so that we find the views of this celebrated pathologist much more generally received in France than in any other country.

In our opinion, both essentialists and localists have taken a much too limited view of the etiology of fever. It appears to us that fever, whatever be its form, depends on some modification of one or other of the elements which enter into the composition of the human body, or in other words, that it follows as a consequence of a morbid condition of either the solids or fluids.

We know that, when the function of any organ becomes seriously disturbed, more particularly if inflammation arise, fever is induced. It is probable that the various external causes, terrestrial or atmospheric poisons for example, induce fever by their action on particular parts, in the same way as the different poisons are known to affect particular structures. On this principle the symptoms peculiar to some epidemics may be explained; for instance, catarrhal fever, in which the mucous membrane of the air-passages is affected; or gastric fever, in which a peculiar impression seems to be made on the mucous lining of the intestines.

We shall endeavour to show, in treating of the pathology of the fluids, that the blood is not only materially changed in fever, but that the diseased state precedes the attack, and that the changes take place in a determinate order. This view is corroborated by Andral, who states "that the fever termed *inflammatory* seems often to arise from no other source than the blood being too rich in fibrine; in like manner, an impoverished state of the blood, whether accidental or natural, is often connected with *mucous* fevers, and with those characterized by a sudden sinking of the vital powers; and that the source and primary seat of *typhous* fevers, properly so called, is proved to be in the blood, inasmuch as they are caused by the introduction of deleterious substances, such as animal or vegetable effluvia, into that fluid."

It is in this way only, by the blood becoming contaminated, and in this state circulating through the system, that fever can be supposed to be, according to the language of Dr. Fordyce, "a general disease which affects the whole system, the head, the trunk of the body, and the extremities; the circulating, absorbing, and nervous symptoms; the skin, the muscular fibres, and the membranes; the body, and likewise the mind." (Dissertations on Fever.)

When putrid substances are injected into the blood of the lower animals, this fluid loses its power of coagulating, and acquires a rapid tendency to decomposition: great sensorial disturbance, convulsions, delirium, hurried breathing, and bloody exhalations also take place, followed by speedy death; and if the poison injected be highly concentrated, the animal is almost instantly destroyed.

The effects which follow from the use of food of an unwholesome quality, or from an insufficient quantity of food, are probably owing to the changes which the blood undergoes from these causes; hence scarcity may act both as a predisposing and exciting cause of fever. In this way, the origin of the disease in times of general distress among the poor is readily explained; and the history of epidemic fevers in Britain shows the intimate connection that has always subsisted between scarcity and fevers of a low or malignant type.

It is also extremely probable, that in fevers which are produced by living in an impure atmosphere, the blood becomes the medium by which the morbific matter is circulated through the system. To prove the effect of putrid emanations on the animal economy, Magendie confined a healthy dog in a situation which exposed him to putrid miasmata. For the first four days there was no change; he then began to emaciate, and died much extenuated within six. Magendie imputed the death of the animal to the effect of the miasmata he respired and took with his food. On opening the body, which was much emaciated, the mucous membrane of the bowels was found inflamed.

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[*] Primæ Lineæ Materiæ Medicæ, Auctore Syrus Borda.—Della Nuova Medica Italiana, Proluzione alle lezione di Clinica Medica nella P. Universita di Bologna per l'anno Scholastico, 1816-1817. Del Professore Giacomo Tommasini.—Dell' Inflammazione et della Febre Continua; considerazioni Patologico-Pratiche. D. G. Tommasini, Pisa, 1820.—Del Metodo di curare, &c. Del Profess. Giacomo Tommasini. Bologna, 1821.—Lezioni di Terapea Speciale sulle Inflammazione, e Rendiconto Clinico, di V. Mantovani, Pavia, 1820.—Institutiones Pathologicæ. Auctore F. A. Fanzago.

CLASSIFICATION OF FEVERS.

Pyrexiæ, or febrile diseases, have been divided into two great classes, — FEVERS and INFLAMMATIONS. In the present article, we shall consider the first class only, referring the reader for the consideration of the second, viz. symptomatic fevers (inflammations), to the separate articles in the work.

The different forms of fever have received various distinctive appellations, founded on their supposed causes. We accordingly find in systematic works various subdivisions, — *camp, hospital, prison,* or *jail* fever. Others have preferred, as a ground of distinction, the peculiar phenomena which each type of the disease presents; hence the origin of the nomenclature, *inflammatory, bilious, nervous, malignant* or *putrid, petechial, typhoid, yellow* fever, &c.

The types of fever which are met with in temperate countries have been arranged according to certain phenomena observed in each. In one form, the symptoms or series of phenomena constituting the febrile paroxysm observe a continued or uninterrupted course; in a second, they do not follow a continuous course, but become either suspended for a definite period, or a considerable remission or abatement only takes place; in a third, the febrile symptoms are accompanied with a peculiar eruption, which, with certain symptoms, indicates a particular form of eruptive or exanthematous fever.

A classification of fevers, founded on these distinctive characteristics, being sufficient for every practical purpose, the following arrangement will be adhered to in the present work:—

1. Continued.
    - *a.* A simple.
    - *b.* Complicated.
    - *c.* Typhus.
2. Periodic.
    - *a.* Intermittents.
    - *b.* Remittents.
3. Eruptive, or Exanthematous.
    - *a.* Variola.
    - *b.* Rubeola.
    - *c.* Scarlatina.

Before entering on the consideration of the varieties of fever, it will be proper to make a few observations on the phenomena which occur in a febrile paroxysm. The paroxysm consists of three stages,—the *cold,* the *hot,* and the *sweating,* which in general succeed each other in the order enumerated.

These terms have been given from the peculiar symptoms observed in each stage: thus in the *cold* stage, there is sensation of cold accompanied by shaking; the *hot* stage is indicated by increased heat; and the *sweating* stage, by the diaphoresis or perspiration which terminates the fit.

The successive stages which constitute a true paroxysm of fever are only observed in intermittent fever, in which there is a perfect intermission, or *apyrexia* between the fits. In continued and in symptomatic fevers (inflammations), though there may be sensible abatement of the febrile symptoms at irregular periods, complete suspension of the disease for a definite time, as is observed in periodic fevers, never takes place. Though these diseases are often ushered in by a sensation of chilliness or actual shivering, almost invariably by morbid heat of the skin, still the rigor or cold stage is so frequently unobserved, that it cannot be said to be essential either to the continued or symptomatic forms of fever.

The first symptoms of the *cold* stage [or stage of concentration] denote a primary impression on the nervous system. This is evinced by the disinclination to exertion, and the evident feebleness or actual prostration. To these succeeds more or less restless uneasiness, which induces the patient to endeavour to obtain relief by frequent change of posture. This restless state is generally accompanied with more or less mental inquietude; hence the inability to fix the mind on any subject requiring continued attention. These are the sensations precursory to the rigor or shivering fit, the first indication of which is a feeling of chilliness: this may be general or only partial; for instance, it may be confined to one or more of the limbs, or to the loins, while the other parts of the body feel comfortably warm. The chilliness, after continuing some time, passes into tremor, which begins first in the lower jaw, and then gradually extending over the body, terminates in general muscular agitation. The tremor is often very severe; in some instances so violent, that according to practitioners who have witnessed the more intense forms of intermittent fever, convulsions have actually supervened; this, however, is to be regarded as a rare occurrence, at least in temperate climates. The skin feels cold, not only to the patient himself, but sensibly so to another person; and when the thermometer is applied, the temperature is found to be many degrees below the average standard of health: according to Dr. Wilson Philip, it has been observed as low as 74° Fahrenheit.

As the cold stage passes off, the skin becomes gradually warmer, though the patient is not always sensible of the change; hence, while he still complains of feeling cold, the skin often feels comfortably warm, or even warmer than natural, to another person.

The appearance of the skin in the cold stage indicates a deficiency of animal heat; the lips, nails, fingers, and toes, in fact those parts at a distance from the centre of the circulation, are pale and shrunk, while the skin becomes rough, resembling that of a fowl after it has been stripped of its feathers: hence the term *cutis anserina* has been applied to express this condition of the skin. The shrinking of the integuments is exemplified by the fact of a ring which fits the finger before the approach of the cold stage, becoming so loose as to fall off soon after it commences. It is also not uncommon for ulcers to dry up, or tumours to diminish in size, and even to subside altogether, while the cold stage of fever lasts: but when the hot stage becomes developed, the finger enlarges, so that the ring again fits tight, ulcers again discharge pus, and tumours re-appear.

From the intimate sympathy between the nervous and circulating systems, there is in the cold stage of fever some alteration in the pulse. At the very commencement of the fit, before the rigor has come on, it is more feeble than natural; during the shivering it is small, quick, and occasionally irregular. The breathing is generally at the same time hurried, often suspirous, and the patient complains of tensive pain or constriction in the præcordial region.

When this unnatural state of the muscular, circulating, and respiratory systems has continued for some time, the mental functions not unfrequently become disturbed, indicated by the restlessness so common in almost every kind of fever, by some degree of confusion, and sometimes delirium, or even coma. In some instances the nervous influence of parts at a distance from the brain becomes impaired, as in the instance of some of the senses becoming affected, or of the patient complaining of a sensation of numbness in the extremities.

The organs of secretion are at the same time more or less deranged. The patient is indifferent to food, and complains of thirst and of a disagreeable clammy state of the mouth. In some instances there is gastric disorder, manifested by frequent retching or vomiting, or purging of bilious fluid. This gastric irritation is, however, seldom observed in the periodic fevers of temperate countries, though in the bilious remittents of hot climates it forms a prominent character of the disease, and is not unfrequently attended with jaundice. The urine in the cold stage is limpid.

The analysis of the symptoms of the cold stage of fever proves the consecutive disturbance of the nervous, circulating, and secreting systems. It is, however, to be remembered that there is great difference in the intensity of the affection in the several organs; the prominent characteristic—the sense of cold, or even the rigor may be altogether wanting, or only represented by a degree of general indisposition, such as languor, chilliness, and sense of feebleness. This will be more particularly pointed out when irregular periodic fevers are noticed.

The duration of the cold stage of fever varies from half an hour to four or five hours, but there is every intermediate variety as to its length. It is often longer in the first than in the subsequent paroxysms, and shorter in remittents than in intermittents; so that, although its average duration may be computed between one and two hours, much depends on the type of the fever, its severity, and the climate in which it occurs. It is always longer and more severe in warm than in temperate countries; it may even be mitigated by the adoption of certain measures to be pointed out when we come to notice the treatment; but as a general rule, it has been observed that when the cold stage is short, the subsequent stages of the fever are almost invariably severe.

Though there is seldom any danger to be apprehended in the cold stage, it is proper to state, that under some circumstances, so great has been the shock given to the nervous system, that the vital powers have never recovered such a degree of energy as to produce re-action; indeed individuals have actually died in the cold fit.

The approach of the *hot* stage [or *stage of expansion,*] of fever is indicated by the chilliness or shivering subsiding, or alternating with warm flushings. The natural heat and colour of the skin then return, the shrinking and cutaneous constriction being succeeded by fullness, especially of the features, which in the beginning of the hot stage appear more turgid and animated than in health. This is followed by increased heat, which becomes gradually diffused over the body, the thermometer indicating an increase of several degrees above the ordinary average temperature of health, (varying from 100° to 105° Fahrenheit,) while the skin feels dry and parched. With these external changes, there are corresponding alterations in the functions of the several organs: for example, the depression, stupor, or coma of the cold stage is succeeded by sensibility to external impressions, so that sounds or brilliant light are offensive; there is generally pain in the head, back, and limbs, and not unfrequently transient delirium. The breathing becomes more free; the pulse, from being small, feeble, and rapid, becomes more full and expanded, and the sense of præcordial constriction, which is so oppressive in the cold stage, subsides. In this accelerated state of the circulation, hæmorrhage from various parts, more particularly from the nose, lungs, uterus, or bowels, is not uncommon. These evacuations of blood have generally been remarked to be salutary, by relieving local congestions, which are apt to take place in the hot stage of fever.

There is little change in the natural functions: there is perhaps more thirst; the urine becomes high-coloured, but on standing does not deposit any sediment; and should there have been much gastric disturbance during the cold stage, it generally abates or goes off entirely as the hot fit becomes developed.

The hot stage gradually terminates in copious perspiration. This constitutes the *sweating* stage, [or *stage of termination,*] which is generally followed by great relief. The upper parts of the body first become bedewed with moisture, the sweating afterwards extending over the trunk and lower extremities. The sensorial disturbance now vanishes, the pulse resumes its natural tranquillity, the breathing becomes easy, and the urine in many instances deposits a sediment some time after it has been voided. The sweating, after continuing some time, disappears, but the patient remains weak and exhausted after the paroxysm has quite disappeared.

Though these three stages occur in regular progression in every well-marked paroxysm of periodic fever, there is great diversity in the intensity and duration of each paroxysm as well as of its several stages, as will be fully illustrated when the different forms of periodic fevers are treated of.

FEVER, CONTINUED.—The division of fever which, according to the proposed arrangement, comes first under consideration, is the *continued*. This class of fevers has been so termed from the paroxysms consisting of remissions and exacerbations, without intervals of abatement or pyrexia, as in the intermittent and remittent types.

In systems of nosology every variety of continued fever is comprehended under the term *Synochus* (from the Greek word συνέχω, to continue.)

The milder forms have been termed *synochus mitior;* the more intense, *synochus gravior;* the intensity depending on the various local inflammations which arise in the progress of the fever.

1. Simple Fever.—There is, perhaps, no disease in which the premonitory symptoms are so diversified as those of fever; this is owing to the general resemblance observed in the commencement of every febrile disturbance, whether idiopathic or symptomatic; and it is not until the symptoms have continued for some time that the practitioner can discriminate the precise nature of the disease.

In idiopathic fever there is generally a period of undefined indisposition, evinced by disinclination to mental exertion: the individual is incapacitated from any ordinary mental effort; his perceptions are less clear and distinct than usual. To this condition of the mental powers the term *languor* is applied, and it is always an indication of the commencement of febrile action. A sensation of *lassitude* or diminution of muscular vigour is next felt; the patient feels fatigued and averse to any kind of exertion; if he attempt to walk, his movements are feebly or unsteadily executed. The muscles soon become unable to support the weight of the body; hence the recumbent posture is not only most easy, but indispensable. Boerhaave first applied the characteristic term *debilitas febrilis* to this state of the muscular system in fever. The alteration in the expression of the countenance, so marked in fever, is probably intimately associated with this condition of the muscular system, and forms a diagnostic of great value to the experienced practitioner, not only of the nature of the disease, but of the various changes which take place in its progress. It is difficult to give in words an idea of the febrile countenance: there is a look of anxiety, denoting much inward distress; the features are pale and sharp; and the whole expression is so changed as at once to alter the character of the countenance: hence the favourable impression which is always taken from any improvement in the aspect of the features.

Irregular chills and sometimes shivering come on; but more generally there are alternate fits of heat and cold of short duration, which continue to recur at intervals, even when the skin is hotter than natural; and it will be observed that during the time the patient complains of chilliness, the skin does not feel cold to another person, nor does the thermometer indicate any diminution of temperature. It appears, therefore, that the coldness is produced by some cause within the system itself, and is by no means to be attributed to external temperature, as it is observed in hot as well as in cold climates, and to recur when every precaution has been adopted with respect to the temperature of the apartment and the clothing of the patient.

About this period there is great restlessness, and uneasiness of an undefined and indescribable nature, which, after a short time, is succeeded by pain in the loins and extremities, with feeling of general soreness.

These symptoms, denoting the first stage of fever, are succeeded by those indicating re-action. The face becomes flushed, and the heat over the surface is steadily and uniformly above the natural temperature, varying from 100° to 105° Fahrenheit. The heat on some parts of the body is perceptibly greater than on others; hence, in those irregular accessions which take place, the increase is chiefly perceptible in the face, hands, and feet. Sometimes, on the other hand, there is no increase of the animal heat in fever; the skin throughout the course of the disease retaining its natural temperature, or in some cases falling even below it: such deviations are always to be regarded as unfavourable, though, as physiology has not yet discovered the source of animal heat, we are ignorant of the causes on which they depend.

If the circulation be now examined, the pulse, which at the beginning is oppressed, will be found quick, seldom, however, exceeding 100°. Besides increased frequency, it may have acquired other characters; it may be quick and soft, or full and strong, seldom, however, hard or tense. It occasionally, though very rarely, happens that the pulse does not, during the progress of fever, vary from its natural condition either as to frequency or power, and even when the other symptoms are well marked. A similar anomaly has just been pointed out as to the heat of the skin, which now and then does not exceed, or even falls below the natural temperature.

Though the function of respiration is not necessarily involved in fever, still, when the febrile excitement is considerable, the breathing becomes hurried. This condition must be distinguished from that which depends on some inflammatory condition of the lungs. The absence of cough in the one instance, and its almost invariable presence in the other, with the sounds elicited by auscultation, will tend materially to aid the practitioner in forming a proper judgment of this symptom. It should also be kept in view that in those forms of fever in which the brain is severely affected, the breathing becomes embarrassed. It is sometimes short and quick, or slow and interrupted. In these cases the state of the breathing is the effect of the disturbance in the brain, and not of pulmonary disease.

When the fever has thus become developed, the primary disturbance of the brain is succeeded by symptoms which indicate increased action in the cerebral vessels. This is indicated by headach; the pain being in some instances confined to the forehead, sometimes to the occiput. It varies in intensity as well as duration, but is always increased on any movement of the body, or any circumstance which excites the circulation. In many instances of the mild forms of fever, however, the patient never experiences headach; he complains only of giddiness or of a sense of heaviness or weight, particularly in the occiput. It is not easy to explain the cause of these differences in sensation, but it is important to bear in mind, that they all depend on one and the same condition of the brain, and require similar though perhaps modified treatment.

As the disease proceeds, the languor and lassitude of the first stage give place to sensorial disturbance, indicated by great restlessness and irritability, and sometimes slight delirium towards evening, which abates or totally disappears in the morning.

The various senses are more or less disturbed;

the hearing is often morbidly acute, so that even slight sounds give uneasiness if not pain; sometimes it is dull and obtuse; the sense of smell is vitiated; the taste is so altered that common articles of diet are scarcely recognised, and there is generally great aversion or loathing of food; the mouth is clammy; the tongue covered with thin white fur; and there is more or less thirst.

The excretions are altered, both as to quantity and quality; the urine is high-coloured and turbid, or deposits a sediment on standing; and the evacuations from the bowels are generally of an unhealthy character.

The fever is now said to be fully formed, or, in popular language, to be at "its height." In the majority of cases, towards the evening, or in some instances at irregular intervals, there is an exacerbation, or general increase of the febrile excitement, which abates towards the morning. The accession is indicated by greater restlessness, by the skin becoming more hot, the face more flushed, and by increased thirst and frequency of pulse. It is probably in consequence of the increased velocity of the circulation through all the organs, and consequently in the brain, during these exacerbations, that the patient is so much more restless and indisposed to sleep; and hence it is that, when there is disposition to congestion or inflammation in any organ, it is often developed at these periods.

With regard to the duration of simple fever, the symptoms may continue without any particular change for a few days; but its limitation depends on a variety of circumstances. It may last only one day, and this constitutes the common *ephemeral* fever, which terminates in twenty-four hours; a form to which women in childbed, from a variety of causes, are occasionally subject: or it may go on for an uncertain number of days, or even weeks, terminating, however, in the majority of instances, about the end of the second or beginning of the third week. It not unfrequently happens that its duration is materially diminished by some spontaneous evacuation; either by the skin or bowels, or perhaps by some accidental hemorrhage; or without such spontaneous efforts of the system, by moderate venesection, if the febrile excitement require the loss of blood, or in milder cases, by purging, confinement to bed, and the adoption of a mild farinaceous diet.

The ancients, who accurately observed the phenomena and progress of fever, remarked that the symptoms showed a tendency to abate at regular periods, which were called critical days. This crisis was observed to occur on the third, seventh, fourteenth and twenty-first days from the commencement of the symptoms, or first invasion of the disease. If the symptoms passed over the first period, those who gave credence to this doctrine predicted, that the fever would go on to the second or beyond it; for example, if the symptoms did not abate on the seventh, that the fever would not terminate till the fourteenth day; if this day were exceeded, that it would run on to the twenty-first, and so on.

Modern physicians place very little confidence in this restricted duration of fever. The ancients, being afraid of interfering in any way with the efforts of nature to get rid of what they supposed hurtful to the system, considered every kind of treatment improper, and were, therefore, more likely to observe, in the milder forms of fever, an abatement by crisis on particular days. The modern treatment of the disease, founded on more just views of its pathology or nature, is very likely to interrupt or disturb such regular periods of decline; and therefore, though the doctrine of critical days is not in our day altogether exploded, practitioners are either less inclined to look for them, or to reject the idea as not according with nature. Besides, in fever complicated with local inflammation, such regularity in the crisis cannot be expected to occur; the symptoms depending in some measure on the condition of the organ, which may, in the progress of the disease, have become inflamed. It cannot, however, be doubted that the notion of critical days was originally founded on correct observation, that fevers are disposed to terminate favourably or unfavourably at certain periods; and though such critical termination cannot in every, or even in the majority of instances, be discerned or traced, the fact, that simple or uncomplicated cases occasionally do so, should always be kept in view.

The convalescence, or period of the decline of fever is observed to be gradual; the feelings of the patient improve, his countenance becomes animated, and its expression so altered, that except by those who are acquainted with the previous aspect of the countenance, the individual would not be recognised—the sleep becomes longer and more refreshing—the pulse comes down gradually till it returns to its natural frequency—the skin becomes cool—the tongue clean, the appetite for food returns—the thirst ceases, and the strength and spirits improve. These favourable changes indicate the stage of convalescence, which is confirmed in a few days under proper management, especially if great attention be paid to the regulation of diet, and avoiding undue bodily or mental fatigue. No consideration should induce the practitioner to relax in his close attendance during this most important, but too often neglected period of the disease.

The description now given applies to the mild epidemic fever of this and other temperate climates. It is almost unnecessary to state, that there is every gradation not only in the intensity, but in the duration of the symptoms. The symptoms may be so mild as scarcely to require more than an aperient, quietude, and abstinence; or they may assume a severe character,—the fever passing into some of the other forms to be afterwards described.

Inflammatory Fever.—A variety of continued fever of a hyper-acute form is occasionally observed, and, though not very common in temperate climates, it does now and then occur, and requires notice. It has been called inflammatory fever (synocha), and may occur at all ages and in all habits, forming the general character of fever in young and plethoric subjects, who have great muscular power and corresponding vigorous circulation. When it occurs in cold and temperate countries, it is distinguished from simple fever (synochus) by its more sudden invasion,—by the more pungent heat of the skin, flushing of the face, suffusion of the eyes and intolerance of light—

more intense headach, throbbing of the carotid and temporal arteries, watchfulness, and delirium. The pulse is seldom very rapid at first, but as the disease proceeds, it becomes full, round, and tense, but never remarkably frequent, and the blood after venesection generally exhibits the buffy coat. The breathing is quick, the thirst incessant, and the febrile restlessness distressing. In some instances, there are nausea and vomiting, with pain in the epigastrium, stretching to either hypochondrium, more especially if this form occur in the summer and autumn months in warm climates, where it is generally termed bilious or bilious inflammatory fever. When inflammatory fever becomes fully developed, spontaneous hemorrhage not unfrequently occurs; if it proceed from the nose, it generally affords great relief to the symptoms, on which account it should not be interfered with, unless it produces feelings of exhaustion.

From the violence of the general excitement in inflammatory fever, local inflammations are exceedingly apt to intervene. It may also pass into other forms: we accordingly find that in warm climates, more especially in the West Indies and some districts of the United States, it assumes very often the remittent type, or it may lapse into a low kind of typhoid fever.

Its duration varies according to circumstances. It now and then assumes an ephemeral character, —disappearing in twenty-four hours: mild cases of longer duration by proper management may pass off in a few days; but if the symptoms be neglected in the commencement, the fever may last two or three weeks or longer, and then gradually subside, the symptoms losing their acute character as the disease advances.

It is proper, however, to state that in our experience of the epidemic fever of this country, this form, (synocha,) if it really do occur, has been seldom observed. A few sporadic cases, which have many of the essential characters detailed, certainly present themselves occasionally in the spring months; but these form a comparatively small average proportion of the ordinary fever of Britain. It is, therefore, to the fevers which occur in warm climates that the description given more particularly applies; the character of fever, as will be afterwards explained, being materially influenced by climate and season, It is also necessary to bear in mind the local inflammations which almost invariably arise in the course of these acute fevers, and the effect of such complications on the febrile symptoms.

Gastric Fever.—When the symptoms of common fever are attended with more than ordinary gastric derangement, the term *gastric fever* has been applied. Hippocrates, with his characteristic discernment, evidently alludes to this variety of fever, in treating of *acute diseases with heat and biliary dejections;* and Galen, the first writer who distinguished fevers into sanguineous and bilious, founded his idea of the latter on the condition of the stools. This form of fever has in later times been called by different names. Baillou first termed it *gastric* fever; Hoffmann, the *choleric;* Baglivi, the *mesenteric;* John Peter Frank, *febris continua gastrica;* Pinel, the *meningo-gastric.*

Disorder in the alimentary canal gives rise, not unfrequently, to fever of a particular form. In other instances, symptoms of gastric disorder may supervene on common fever; in either case, the train of symptoms, which are very much alike, and require a similar mode of treatment, are in the one case the cause, in the other, an accidental accompaniment of the fever.

Gastric fever may occur sporadically; at other times the gastric symptoms form the prominent type of an epidemic; and from its prevailing in the summer and autumn months after very hot weather, it would seem to be produced by some atmospheric or terrestrial emanations peculiar to this season of the year. There are several accounts on record of epidemic gastric fever; indeed, the fevers of Britain towards the end of summer and in the autumn are almost uniformly accompanied with gastric irritation, and from our individual experience of the character of fever for the two preceding years (1830 and 1831,) we can affirm that an unusual degree of gastric disorder has accompanied the disease during the whole of that period. The type of the fever has moreover been low and typhoid to a degree which has not been witnessed for many years preceding, so much so as to preclude the employment of evacuations of any kind, and to render stimuli necessary to an extent very unusual in the London Fever Hospital.

From a communication with which we were lately favoured by our friend Dr. Brown of Sunderland, it appears that a similar type of fever preceded the late visitation of cholera in the north of England. This fact, with the similarity of the symptoms of epidemic fever in those situations in which cholera has hitherto appeared, renders it probable that some peculiar condition of the atmosphere has given a tendency to gastric disorder, not only in fever but in other acute diseases. It is a singular circumstance, also, that when cholera appeared in London, epidemic fever sensibly diminished both in frequency and severity, while the gastric irritation and prostration of strength, which formed the prominent features of fever, have also nearly subsided.

In gastric fever there is great variety in the mode of attack and sufferings of the patient. In some cases there is so little evidence of illness that the patient follows his ordinary pursuits, thinking he is only indisposed from derangement of stomach, till the prostration of strength and the gradual accession of febrile symptoms show evidently the nature of the disease. In other cases the symptoms from the beginning are so well marked, as to leave little doubt of their nature and tendency.

The precursory symptoms are very similar to those of other forms of fever — sense of chilliness, rigors, irregular flushes of heat, languor, lassitude, pain in the head, loins, and extremities. The face is pale and sallow, the conjunctiva yellow; the mouth clammy and bitter, the breath fetid; the tongue at first is slightly coated with thin white or grey fur, which increases in thickness, becoming yellow over the body and root, while the point and edges are red: in other cases, it is clean and morbidly red from the beginning.

More or less disturbance of the stomach is observed early in the disease; there is pain or sense of weight or distension in the epigastrium; often nausea and retching, which generally ends in vomiting of bilious fluid: the state of bowels is variable; there is either constipation alternating with diarrhœa, or there is purging from the commencement, the stools being watery, of a pale green, or brownish yellow colour, extremely fetid, and occasionally mixed with blood. The pulse, which from the commencement may not have been much accelerated, now becomes rapid; the breathing hurried; the heat of skin pungent; the febrile uneasiness and general pain increased; and towards evening, there is exacerbation of the symptoms, with watchfulness and delirium. As the morning advances, however, a distinct remission takes place, accompanied with gentle moisture on the forehead and chest. The coating on the tongue becomes more thick, sometimes dry and brown; and the urine, scanty and passed with pain, deposits a lateritious sediment.

At a still more advanced period of the disease, we observe the morning remissions so slight as to be scarcely noticed, while the whole complexion of the symptoms becomes aggravated; the delirium, which was perhaps only noticed towards evening, is constant; the tongue, palate, and throat are more dry, and covered with viscid mucus, or a dry, hard, black crust envelopes the tongue, which is sometimes irregularly fissured and covered with aphthæ; the speech and sense of hearing are impaired; the eyes suffused; the pulse is very rapid and compressible; the evacuations are passed unconsciously, with tympanitic distension of the abdomen. This congregation of symptoms denotes an intense and advanced form of gastric fever, from which the patient not unusually perishes, though if the previous powers have been vigorous, and the treatment judicious, the patient may be recovered. When a favourable termination is about to take place, the delirium abates, the morning remissions become again distinct and of longer duration, the skin cool and soft, the tongue and palate moist, the former throwing off its dark incrustation and exhibiting the subjacent mucous membrane morbidly red and tender; the bowels become pungent, the stools more consistent, and the abdomen feels soft from the subsidence of the tympanitic distension.

When a fatal termination is about to ensue, the yellowness of the eyes, headach, delirium, and flushing increase; the patient, at one time furious, becomes drowsy and comatose; the stools, and occasionally the urine, bloody and passed involuntarily; the tongue, tremulous, and, as well as the teeth, covered with dry black fur, cannot be protruded. To these symptoms succeed picking of the bed-clothes, starting of the tendons, hiccup, rapid breathing, cadaverous smell of the perspiration and breath, cold sweats, imperceptible pulse, and coldness of the extremities.

It is necessary to state that in gastric as well as other forms of fever, local inflammations arise in its progress. It is, therefore, important to watch the symptoms in the different organs, more particularly the brain, which from the inflammatory type of the fever at the commencement is often severely affected. In like manner the several organs in the chest and abdomen may become inflamed, and render the disease formidable.

Frank states, that in some cases quantities of worms are expelled from the stomach and bowels during gastric fever. In such instances the febrile symptoms are accompanied with those peculiar to vermination — wandering pains, itching of the nose and anus, prominence of the abdomen, vomiting, tenesmus and copious mucous stools.

The duration of gastric fever is uncertain. When the disease is mild, it may not last above a week or ten days; generally, however, it is tedious and protracted, more especially if neglected in the early stage. It is unnecessary to state that its duration will be materially affected by any inflammatory complication with which it may happen to be associated.

The history of epidemic gastric fever, written for this work by Dr. Cheyne, gives an admirable sketch of this variety of fever; and we beg particularly to call attention to the observations of that able physician on this subject. (See FEVER, EPIDEMIC GASTRIC.)

2. COMPLICATED FEVER. — In the preceding observations it has been our object to show that in *simple* fever the disturbance in the various organs, however severe, is only functional, no inflammation in any organ having as yet taken place.

It is necessary, however, that the practitioner should bear in mind, that although fever at its commencement may be mild, in a large proportion of cases it assumes a severe character, in consequence of some local inflammation arising in its progress. Hence, whatever be the primary effect of the exciting causes on the various organs, the transition from excitement to inflammation is often rapid, more especially when there is predisposition to disease in any particular organ.

From what has been previously advanced, as well as from the facts which will be adduced when the causes of fever are discussed, there are strong grounds for supposing that the febrile poison produces a peculiar or specific effect on certain organs of the body in the first instance. The affection thus primarily induced, whatever it may be, is not, however, of an inflammatory character, though it is evident, both from symptoms observed during life, and from morbid appearances after death, that inflammation does arise in certain organs in the progress of fever. If the febrile poison be not in a state of great concentration, it may be presumed that a peculiar action only is exerted on one or more organs; if the poison be in a state of greater activity, it would appear to produce severe organic lesion — inflammation and its consequences.

We do not pretend to explain the modus operandi, or theory of action of the causes alluded to; or why, in individuals exposed to the same causes, in one case very slight effects, while in another the most severe and often fatal symptoms are produced. There may be greater aptitude for the reception of the febrile poison in one person than in another, arising from individual peculiarity or idiosyncrasy, as it has been termed.

This tendency of the primary febrile affection to pass into inflammation, which local inflammation is the cause of the severity in the majority of cases of fever, should never be overlooked. It is equally important to bear in mind that the inflammatory action which supervenes, is of a less intense kind than in the ordinary phlegmasiæ.

There are few organs in the body which are not occasionally affected in fever. Some, however, suffer more uniform and severe lesion than others; as, for instance, the brain and spinal marrow, the mucous membrane of the lungs, and of the alimentary canal. Inflammation of the parenchyma of organs is occasionally, though less frequently, observed.

Cerebral complication.—From the almost invariable disturbance in the brain and nervous system in fever, it is particularly necessary to watch any tendency to transition from functional disorder to inflammation of the brain. Not only the symptoms during life, but the morbid appearances discovered after death prove that inflammation of the membranes of the brain is by far the most frequent and dangerous of the local inflammations that occur in the progress of fever.

The cerebral affection assumes various degrees of intensity. In some cases it is mild, in others severe; and between these extremes there is every intermediate modification. Sometimes the cerebral affection appears in solitary instances during a mild epidemic, or it may form the prominent character of epidemic fever.

If the symptoms be attended to, it is impossible to overlook the first indications of acute affection of the brain in fever. The general symptoms may at first be little urgent, and proceed as has been stated in the history of mild fever. The patient, however, is afterwards observed to complain of more constant and severe pain in the head, accompanied with throbbing of the carotid and temporal arteries, flushing of the face, and heat of the scalp. In general the pain is confined to a particular part, very often to the forehead and temples, occasionally shooting to the occiput; at other times it is felt chiefly in the back of the head.

In many instances the cerebral inflammation is not indicated by pain, but by giddiness. Even if the head be shaken, or suddenly moved, no pain is induced, though the giddiness and flushing are increased. Moreover, when pain in the head has existed, it is often of short duration; but, notwithstanding it has ceased, the local affection may be proceeding with equal, if not increased vigour, and, if not arrested, may speedily destroy life. The absence of pain in such cases, therefore, must not be allowed to throw the practitioner off his guard; he must be guided in his opinion of the condition of the brain by the presence of other equally pathognomonic signs. Thus the eyes are brilliant or suffused, their expression either morbidly animated or dull, but generally sensible to light; hence the contracted eyebrows, half-closed eyelids, and the relief experienced from a dark room.

The sense of hearing is also morbidly acute. Sounds which the patient has been accustomed to hear without even exciting attention, become disagreeable, or even painful; every precaution in such cases is therefore taken to lessen the intensity of sounds.

Though the febrile action usually produces a state of watchfulness, this condition is much increased when the brain becomes inflamed; it is often accompanied with a degree of restlessness or moaning; but after the cerebral vessels have been unloaded, the patient generally becomes tranquil, and enjoys intervals of refreshing sleep.

There is also in cerebral inflammation more or less intellectual disorder. In milder cases, the patient is perfectly conscious while awake, but if he drop asleep, it is interrupted by talking; and when he awakes, he is for a time forgetful, utters perhaps a few incoherent sentences, and then becomes perfectly sensible. As the evening approaches, however, the confusion becomes again perceptible, especially on the termination of the occasional short periods of disturbed sleep which attend this stage of the disease. In more severe cases, delirium is observed at intervals during the day when the patient is awake; and if the symptoms in the brain be urgent, it is incessant, loud, and noisy.

The symptoms enumerated indicate a degree of inflammation of the brain, not uncommon in the epidemic fever of this country, which, if treated by the early and vigorous employment of suitable measures, is in general readily subdued, and the recovery proceeds satisfactorily.

The cerebral affection, however, occasionally assumes a more severe form; and those destructive changes which often rapidly take place in the delicate organization of the brain, sufficiently show the intensity of the previous inflammatory action. The symptoms which indicate this more severe form of brain affection differ from those which attend the sub-acute, chiefly in degree. The pain is more severe and constant; the patient often rolls the head from side to side; the eyes are more suffused; the sensibility to light and sound is greater; the breathing is rapid and suspirious; the anxiety of countenance is increased; the restlessness and delirium assume a more formidable character: while the noisy vociferation or screaming is incessant, the violence of the patient often requiring restraint. The pulse is more round and tense, but in some cases it is soft, irregular, or intermitting. The skin is hot, and often perspires profusely, in consequence of the incessant bodily agitation or struggling. If active treatment be neglected in the beginning, or should the attack in the brain be of such a severe character as to bid defiance to the treatment employed, the powers of the system give way; the delirium does not subside, but it loses by degrees its acute character; the patient becomes drowsy, and observant only when roused; the eyelids are half closed; sometimes there is squinting or rolling of the eyeball, with dilatation of the pupils; muscular tremor and starting of the tendons come on; deglutition is performed with difficulty; and the drowsiness finally passes into profound coma. The patient then becomes insensible to all external objects; the urine and stools are passed involuntarily; the tongue becomes dry and brown; the teeth and lips covered with sordes; the pulse rapid and feeble, occasionally irregular; and life is speedily destroyed.

It is necessary to bear in mind that between acute and sub-acute inflammation of the brain in fever, there is every variety of degree or intensity. In many instances the cerebral inflammation assumes a slow insidious character, and is only detected by vigilant examination. Sometimes when there is considerable excitement in the brain, the pulse and other febrile symptoms do not indicate much febrile action; the pulse may not be above the average frequency of health. In some cases the pain ceases entirely, and is succeeded by partial insensibility. The skin may be cool, and the tongue little furred; yet notwithstanding these favourable circumstances, a low form of chronic cerebral inflammation may be going on.

In some instances, again, inflammation of the brain suddenly comes on in the progress of the fever, when there were no previous warnings of its approach. Hence the necessity of watching with incessant vigilance every case of fever during its progress; as no case, however mild or promising, is free from the possibility of sudden attacks of inflammation of the brain.

Pulmonary Complication.—The organs of respiration at certain seasons, and in particular epidemics, suffer from inflammation in the course of fever. Laennec states on this subject, that "one of the most interesting results which auscultation has furnished is the constant presence of a catarrhal affection, either latent or manifest, during the whole course of continued fever. At the commencement, and most commonly through the whole period of the fever, the catarrh is latent, without cough and expectoration, and only to be discovered by the stethoscope. Sometimes it becomes manifest on the approach of a crisis; and, indeed, the crisis by expectoration noticed by the ancients is neither more nor less than this catarrh. Catarrhal fever is applied to those forms in which the catarrh, just stated to be inseparable from continued fevers, early manifests itself, and gives rise to a copious mucous expectoration. The same appellation has also been given to those violent catarrhs which are accompanied by a symptomatic fever; but in this case the fever, though considerable at first, and often of long continuance, soon loses the character of acute fevers, terminates long before the catarrhal affection, and never presents that combination of cerebral congestions and abdominal disorder, more or less severe, exhibited by true idiopathic fevers, which must be considered as diseases affecting at the same time a great many organs, and perhaps still more particularly the fluids. In eruptive fevers the pulmonary catarrh is equally constant, and most commonly in them it is manifest. In measles it is well known always to be so, and it continues often for a long time after this disorder is cured. The same thing occasionally takes place after simple continued fevers; but in these I have also had frequent occasion to observe, that when a crisis takes place, at the very time when the lateritious sediment shows itself in the urine, every sign (even stethoscopic) of perhaps a very intense and extended catarrh disappears at once with the coma, tympanitic affection, quick pulse, heat, and earthy character of the skin. During the paroxysms of intermittent fever the stethoscope detects in like manner symptoms of catarrh, for the most part dry and latent, and of which some traces remain in the intervals. Even the fevers which are most decidedly symptomatic, for instance those arising from a wound, very commonly present the same phenomena. It would, therefore, seem that the first effect of febrile action is to produce a congestion in the mucous membrane of the bronchi; and this effect is readily conceived on taking into consideration the energy of the actions of concentration and expansion which constitute fever. The inflammatory fever of nosologists, that is, the fever characterized by a flushed countenance, moist and clean tongue, and a moist and moderately hot skin, is, of all fevers, that in which the marks of dry catarrh are the least perceptible. I have even observed two cases of this fever in which the sound of respiration through their whole course was uniformly strong and *pure*, that is, unmixed with any kind of rattle over the whole extent of the lungs. It may here be remarked that this species of fever is, of all, the least liable to change into another form; that it is rarely accompanied by symptoms of any considerable degree of cerebral congestion; that it is hardly ever attended by signs of irritation, or by eruptions or ulcerations of the mucous membrane of the intestines, or by a tympanitic state of the same; and, lastly, that it is almost the only fever in which the blood exhibits the inflammatory crust. In all these respects, then, the inflammatory fever appears to differ either in its nature or cause from other continued fevers; it is unquestionably the most simple of all, and can least of all be considered as a primary affection of the solids. Pulmonary catarrh is occasionally a striking symptom of pernicious intermittent fever. This appears to have been the case in the epidemic catarrhal fever of 1778; for we find a French Medical Society about that time giving it as a prize question, '*To ascertain the relations of remittent catarrhal and pernicious fevers.*'" (Laennec, p. 101–2.)

Although bronchitis is a very frequent complication of fever, especially in some epidemics, and at particular seasons, it is by no means so universal as the observations of Laennec would lead us to suppose; neither is it to be considered an essential constituent of either continued or remittent fevers; but that it does occasionally supervene in both forms is undoubtedly true. It is, perhaps, of all the complications, the most universal in the fever which occurs in the winter and spring months in this country; and no doubt its frequency is in a great measure to be imputed to the sudden variations of temperature peculiar to the climate of Britain.

The symptomatic bronchitis of fever is scarcely to be recognized during the first few days. When it becomes more developed, the symptoms are, besides those which are proper to fever, pain or constriction in the chest, slight acceleration in the breathing, with wheezing sound (mucous rattle) of the respiration on applying the ear or stethoscope to the chest. There is generally at the same time cough, which comes on in fits; it is dry in the early stage, but in the course of a day or two expectoration of viscid mucus, which is expelled with difficulty, and occasionally streaked with blood, takes place. As the bronchitis proceeds, the expectoration becomes more copious and easy, and of a pale yellow or greenish colour. The mucous rattle may be partial or extensive, according as the bronchitis is confined to a small or large portion of the lung. When it is heard over the whole of one lung, the bronchial affection is severe; if it be distinct in both lungs, the case generally terminates fatally. In some cases, however, there is no cough, the existence of the bronchial affection being indicated by slight acceleration in the breathing, with sense of constriction in the chest. The absence of cough renders the local disease very apt to be overlooked; but the state of the respiration, with the aid of stethoscopic examination, will generally sufficiently point out its existence.

In many instances, especially in persons who have had former attacks of pulmonary catarrh, the bronchial affection assumes a more intense form. The breathing is hurried and oppressed, especially after fits of coughing; sometimes it is slow, laborious, and wheezing; the lips are of a dark blue, or livid colour; the cheeks flushed or of a dusky hue. In still more intense cases, the whole countenance becomes suffused with dark-coloured blood, and from the air-cells being clogged with viscid mucus, the blood is not duly arterialized; the functions of the brain are, consequently, more or less embarrassed, according to the severity of the bronchial affection. The patient first becomes occasionally incoherent, and afterwards comatose; the pulse soft and feeble; the tongue covered with deep brown, or almost black crust, while the temperature of the skin, more especially of the parts at a distance from the centre of the circulation, falls below the natural standard. It is unnecessary to add that these symptoms indicate great danger; for although recovery under such circumstances may take place, the majority die from the destructive effect of unoxygenated blood on the brain and nervous system.

It should be kept in mind, that in cases of fever accompanied with severe affection of the brain, the various local complications become so much obscured as to be in many instances entirely overlooked. It has been already remarked that symptomatic bronchitis is often latent in the early stage. When the affection of the brain has been urgent, the bronchial affection never becomes so fully developed as to be recognised by its usual symptoms; it may be going on in an intense form, without any suspicion of its existence. The advantages to be derived from auscultation under such circumstances must be evident; and, therefore, in all the severe forms of fever, the application of the stethoscope should never be omitted.

Though bronchial inflammation is the only form of disease of the chest, which can be said to be peculiar to the severe forms of fever, yet true pneumonia and even pleurisy may arise in the progress of the fever, more especially during the stage of convalescence in cold variable weather, and often under such circumstances prove fatal.

In some instances these inflammations, also, assume a slow insidious character, or become entirely latent; and so obscure do such complications become, that extensive organic changes have been discovered after death, the signs of which have been either very doubtful or entirely wanting during life. Such cases are more common when the previous affection of the brain has been severe; and hence the necessity of frequent stethoscopic examinations in the course of fever, especially if protracted.

It is here necessary to advert to a particular form of fever, which has at various times appeared epidemically in different parts of the globe. From the catarrhal symptoms which gave the peculiar character to the disease, it was termed *catarrhal fever*, *epidemic catarrh*, or *influenza*. The disease appears to have been the consequence of an atmospheric poison acting on the mucous membrane of the air-passages; and from the extent to which it prevailed, and other circumstances observed in those who were seized with the disorder, to have had strictly and truly an epidemic origin. It spread over large territories, travelling from north to south, though less frequently from east to west. The epidemic of 1781–2 is recorded to have first made its appearance in China, and to have traversed Asia into Europe; from thence it crossed the Atlantic, and extended the following year over the continent of America.

The symptoms usually commenced with alternate fits of chilliness and heat; sometimes shivering preceded the febrile indisposition. The patient soon after felt great languor and feebleness; the debility and depression of spirits being always to a greater degree than could have been anticipated from the mildness of the other symptoms. The most striking feature of the disease next appeared —a distressing pain and sense of constriction in the forehead and temples, often extending over the whole face, and accompanied with a sense of soreness in the cheek-bones. These symptoms were followed by uneasy sensation about the eyes, sneezing and hoarseness, incessant cough, with soreness and constriction about the præcordia, or stitches in the chest, and pain in the back and loins. To these succeeded lachrymation and profuse discharge of thin mucus from the nostrils and lungs, which continued through the course of the disease.

The appetite and sense of taste were much impaired or entirely lost; in many cases there was nausea, and sometimes vomiting; the tongue being coated with thin mucus. The thirst was inconsiderable; the state of the bowels variable; in some they were regular, and in others confined; sometimes there was spontaneous diarrhœa, generally attended with pain, at various periods of the disease.

The pulse, though frequent, was soft and easily compressed; the heat of skin was relieved by irregular sweatings. Daily exacerbations and remissions of the cough and fever were in many instances observed; in others, they did not occur, or, if they did, were so slight as to escape observation.

The disease was in some cases very mild; sometimes there was only slight fever, with soreness of the throat and uneasiness in the chest, but no discharge of mucus; but the languor and lassitude were always well marked. In some the disorder began like smart fever, and in a day or two assumed the characters of common cold, and continued to hang about the patient for a period varying from a week to a month.

Abdominal Complication.—Of the organs situated in the cavity of the abdomen, the mucous membrane, but more especially the follicles of the small intestines, undergo certain changes, and although these intestinal lesions are by no means invariable, yet, as we have before stated, in some epidemics, and in the fever of particular localities, they are frequently observed, and form severe and often dangerous complications.

In milder cases of the common fever of this country there is probably little if any intestinal affection; but in the more severe forms the intestinal disease becomes a prominent characteristic of the fever, and generally induces sympathetic disturbance of the brain, or should the cerebral affection have already existed, never fails to increase it. In gastric fever the abdominal symptoms are often so obscure and insidious as scarcely to attract serious attention till the disease has made some progress. Indeed, in fever, destructive disorganization of the bowels may be going on without the practitioner or patient being at all aware of its extent, from the want of diagnostic symptoms to indicate the intestinal lesion on which the danger depends. It is often the cause of slow and protracted fever, and a febrile indisposition which is mild at the beginning often becomes serious from the supervention of this secondary intestinal affection. It may be suspected in such cases, when, in addition to the ordinary febrile symptoms, the skin is dry and parched, the thirst excessive, the lips and prolabium red, the tongue red at the point and margin, the bowels irregular (diarrhœa alternating with constipation), and the abdomen tympanitic, with or without tenderness.

When the brain becomes sympathetically disturbed, the face is flushed, delirium supervenes followed by more or less stupor or coma, and insensibility to pain and to the evacuations by urine and stool.

Dr. Bright, who has given an excellent account of the symptoms and morbid anatomy of this intestinal affection as it occurs in the course of continued fever, (Report of Medical Cases,) considers diarrhœa to be the first symptom which indicates its existence. This sometimes exists from the beginning, but more commonly does not come on for nearly a week; the stools are frequent, five, six, or eight in the course of twenty-four hours, and, at first, feculent, dark, and fetid; but afterwards thin and watery, and as if ochre had been mixed with them. The ochre diarrhœa Dr. Bright considers to be characteristic of the commencement of intestinal ulceration, the increasing or decreasing frequency, quantity, and consistence of the evacuations indicating the progress of the intestinal disease. There may or may not be abdominal tenderness or tormina, but when there is pain of the abdomen on pressure, he considers it indicative of inflammation having extended to the peritoneum. Dr. Bright corroborates the opinion already given as to the subsequent sympathetic disturbance of the brain arising from the condition of the intestines, but admits that the cerebral affection may precede and be entirely independent of the intestinal disease, though it progressively increases or diminishes according to the progress of the ulceration of the bowels.

We have already alluded to the opinion entertained by many French pathologists that the follicular disease which was first described by M. Petit is the primary cause of fever. Cruveilhier states that, after he and his fellow-students had watched at the Hôtel Dieu the progress of severe fevers (les fièvres graves), and the seat and character of the lesions after death, they became tired of the vague denomination of inflammatory, bilious, mucous, adynamic, and ataxic fevers, finding the same anatomical characters were always discovered in the intestines; they therefore proposed to substitute the term *intestinal fevers*, for the more vague phraseology which had been introduced. He asserts that this follicular disease occurs under three forms: 1. the acute or inflammatory form · 2. that accompanied with prostration and stupor (*adynamic form*); 3. that attended with cerebral excitement and delirium (*ataxic form*). Inflammatory complications may arise and give a particular character to the disease, but still the original primitive follicular disease exists, and constitutes the most characteristic feature of the malady, which is seated always in the extremity of the small intestines. The ileo-cæcal valve is the principal seat of the lesion; it extends thence as from a centre, gradually diminishing from the last twelve inches to two or three feet in the ileum.

The follicles of the cæcum, appendix cæci, and ascending colon, are also occasionally affected The mesenteric glands corresponding to the diseased portion of intestine are inflamed and enlarged: hence the name *entero-mesenteric* fever given to this disease, of the symptoms of which Petit has given the following summary:—Feeling of debility and general indisposition; loss of appetite; lassitude; and irregular attacks of fever; the countenance expressive of prostration; the skin, especially about the lips and alæ nasi, often harsh and dry; disinclination to exertion; great torpor and intellectual dulness. The febrile symptoms are obscure during the day; but there is an exacerbation towards night, without shivering or much heat of skin; the eyes, before languid, become injected; there is slight delirium; the thirst is urgent; the teeth are dry; the tongue is coated with grey fur; the stools, which vary in frequency and abundance, are bilious, or serous, and insufficient to account for the prostration; the abdomen is soft, and not distended; there is little if any tenderness, but pressure applied to the right side, between the umbilicus and crest of the ileum, often causes pain. As the symptoms increase, the cheeks become livid; the eyes sunk and suffused; with constant somnolence and delirium, though the patient when roused gives intelligent answers. Petechiæ, subsultus, and tremors supervene; the pulse becomes rapid and compressible; the teeth covered with sordes, and the tongue with brown or black crust. Abdominal tenderness now succeeds, the pain being in some cases still confined to the ileac region, and without tympanitis; in other cases more diffused, and accompanied with distension. The stools are frequent, serous, and offensive, and the urine is scanty. Excoriations succeeded by sloughing of the nates, and tendency to gangrene on those situations to which blisters have been applied, protract the sufferings of the patient, unless, as generally happens, death puts an end to complicated misery. It is asserted by the French pathologists that it is the most common form of fever in France, and that it may occur sporadically, or constitute the principal feature of epidemic fever.

The successive changes which take place in the mucous follicles during the progress of fever will be explained in the morbid anatomy. It will then be shown that the destructive processes of ulceration go on progressively, until the coats of the intestines are destroyed in succession, and intestinal perforation at length takes place. The symptoms which denote that this lesion has occurred are, sudden intense pain, with rapid distension of the abdomen, small quick wiry pulse, and peculiar alteration of the countenance. Intestinal perforation is always fatal, generally within thirty-six hours.

Though *peritonitis* cannot strictly be said to form one of the complications of fever, it occasionally supervenes, more particularly at the period of convalescence. Peritoneal inflammation is readily distinguished by the acute pain in the abdomen, increased on pressure; by the knees being drawn up towards the belly; by the sickness or vomiting, and the small wiry incompressible pulse. In some cases, however, there is neither sickness, vomiting, nor frequency of pulse; but only tenderness of the abdomen on pressure. Whether, therefore, this symptom (abdominal tenderness) be accompanied with other distinguishing signs of the disease or not, it should never be overlooked, but treated with decision, as abdominal inflammation may be going on, and even proceeding to a fatal termination, with a quiet pulse and soft skin.

In the preceding account of the complications which occasionally arise in the progress of fever, we have confined the description to cases in which the lesion has arisen either in the brain, in the chest, or in the abdomen.

It happens, however, that in some instances complications take place in more than one organ at the same time. Thus there may be cerebral affection from the commencement of the fever, and in its progress pulmonary or abdominal symptoms may arise; or there may be primary gastric symptoms, with which the brain sooner or later sympathizes. In still more severe cases, inflammatory symptoms in the brain, chest, and abdomen may exist at the same time. It is seldom, however, that in such instances the organs suffer equally, there being generally one on which the inflammatory action has seized with greater intensity.

It is important to remember what has been already stated, that in those more severe cases in which the cerebral affection predominates, should inflammation in some other organ subsequently arise, the symptoms are more or less masked by the cerebral disease. Hence arises the obscurity of the symptoms in those cases of latent pulmonary disease with which fever is frequently complicated, the symptoms being in a great measure concealed by the condition of the nervous system.

In like manner, shodld peritonitis supervene, the pain may be so slight as not to be felt even on pressing the abdomen: if, however, this condition of the brain subside, the tenderness of the belly becomes developed, so that the practitioner is very apt, if not aware of the cause of the sudden sensation of pain, to ascribe it to an unexpected attack of intestinal inflammation.*

3. Typhus Fever.—Different explanations have been given of the origin of the application of this term to a peculiar form or type of fever, characterized by the more early and severe affection of the brain and nervous system—by the more constant changes which the mucous membranes undergo—by affection of the cutaneous and glandular systems—and in the advanced stage by great prostration and symptoms denoting putrescence.

According to some it is derived from the Greek word τύφος, signifying *stupor;* and by those it is affirmed, that the peculiar expression of stupor in the countenance first suggested its application. By others it is contended that the term is deduced from τύφω, to smoulder, or to burn and smoke without vent.

Various other appellations have been given to this class of fevers. It has been designaied *malignant fever* from the severity of the symptoms. Willis termed it *nervous fever;* Huxham, the *slow nervous fever*. John Peter Frank combined, under the name *nervous*, every fever accompanied with prostration and unusual affection of the nervous system; other writers have termed it *prison, jail, hospital, camp* fever, &c.

The order first established by Pinel, to which he gave the name *adynamic*, (want of power,) is more closely allied to typhus than any other type of fever. It is occasionally observed during the prevalence of epidemic fever, and distinguished by great debility, prostration, feeble but not always accelerated pulse, intellectual disorder, impeded or difficult articulation, and involuntary evacuation of the urine and stools.

A variety of this form he called *ataxic* (irregular): it resembles the adynamic as to its origin, but he conceived there was greater disturbance of the nervous system, generally the effect of subacute cerebral inflammation.

We have been able, during the prevalence of epidemic fever, to discriminate both the adynamic and ataxic varieties, and we were certainly struck with the accuracy of Pinel's description; but though these forms bear a strong analogy to typhus, we think they only form an intermediate class between the more acute and typhoid types. Though the majority of French writers have retained typhus fever in their arrangement as a distinct class, others, more especially Louis and Cruveilhier, as we formerly stated, ascribe the whole symptoms to primary affection of the mucous follicles of the intestines.

To this, however, we by no means assent, as we have traced the progress of typhous fever, both in the London Fever Hospital and in private practice, to its fatal termination, and on the most minute examination have been unable to discover the follicular disease which these authors state to be so invariably its cause; while on the other

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* That some estimate of the comparative frequency of the several local lesions which arise in the progress of fever may be formed, the result of 521 cases selected from the journals of the London Fever Hospital is annexed.

Cases in which the fever was not apparently complicated with local inflammation in any organ	163
Cases complicated with cerebral affection	114
thoracic affection	103
abdominal affection	71
cerebral and thoracic affection ..	26
cerebral and abdominal affection	30
cerebral, thoracic, and abdominal affection	14

hand we have met with follicular ulceration in individuals the symptoms of whose previous disease had no resemblance to those of typhous fever.

[Of late, two distinct forms of continued fever have been admitted by many pathologists, to one of which they have given the epithet of *typhoid;* the other being true *typhus;* and it has been maintained, with what truth will be investigated hereafter, that these differ essentially from each other in their anatomical characters—the typhoid affection being connected with, if not dependent on, an inflamed or ulcerated condition of the intestinal follicles; whilst in true typhus there is no lesion of follicles. By many, and, at one time, by M. Louis, it was maintained that typhus is contagious whilst typhoid is not; but it is now admitted by that distinguished observer that the latter disease can be propagated from one individual to another.]

The typhoid form of fever is observed in some individuals during an epidemic of a very different type. When such sporadic cases occur, they probably arise from some peculiarity in the individual, or in the circumstances in which he may be placed. It is not uncommon to find fever, which at first is very mild, assume by degrees the typhoid character. If an individual, seized with fever, reside in an unhealthy district, or be confined in a small crowded apartment, where no attention is paid to ventilation and cleanliness, the probability is that a disease, comparatively mild at first, will be converted into one of severity and danger, from the low character which the symptoms assume.

This is corroborated by the amelioration in the general aspect of the case within a short time after a patient has been removed to a more open district, or into a well-ventilated chamber. Physicians attached to fever hospitals are often struck with the marked improvement under such circumstances. The amelioration is not to be imputed to the treatment pursued, so much as to the effect of a more pure atmosphere and the frequent ablution and changes of linen, which are so essential in fever.

At other times the type of an entire epidemic is typhoid, and of such epidemics there are many recorded histories; hence the importance of endeavouring to ascertain, after the example of Sydenham, not only the character of fever in different localities, but the nature of the epidemic at different seasons, that the physician may successfully apply those principles of treatment which the type of the fever requires.

There can be no doubt of the existence of every intermediate gradation between the common forms of fever (*synochus*) and typhus, so that it often becomes a matter of nicety to discriminate to which class a particular case or number of cases properly belongs. Sometimes we find, indeed, the one form passing into the other, more frequently mild fever lapsing into typhus.

There is, in general, a perceptible difference in the severity of the symptoms in different cases of typhus. This has led to the distinction, proposed by Cullen, of Typhus Mitior and Typhus Gravior.

In typhus mitior the febrile symptoms are mild, though it is evident from the intellectual disorder and prostration, that the nervous system is much affected. It is probable that in these cases, especially at the commencement, there is no inflammatory action in the brain, — the whole phenomena, viz. great languor, feeling of debility, muscular prostration, soft feeble pulse, giddiness, intellectual dulness, and transient delirium, being the result of the peculiar operation of the febrific causes on the nervous system.

Sub-acute inflammation of the brain often supervenes on this condition of the nervous system; and when this takes place, the more prominent symptoms of cerebral inflammation are recognized; and to the difference in the intensity of the cerebral affection may be traced the infinite variety of nervous symptoms which individual cases present.

Of the lesions in other organs which arise in the more severe cases of typhous fever (*typhus gravior*), congestion or inflammation of the mucous membranes, bronchial and intestinal, and inflammation of the parenchyma of organs, are the most important. The congested state of the capillaries of the mucous membranes, the blood being at the same time in a state which favours its transudation, occasionally gives rise to hemorrhage from different parts, more frequently, however, from the bowels than from either the nose, lungs, or any other cavity; and when the hemorrhage is excessive, the already exhausted powers of the patient are often irrecoverably sunk. A similar hemorrhage action is not unfrequently manifested in the skin, in the form of small red spots (*petechiæ*). These vary in colour and size; they are sometimes of a bright red, in other cases of a darker red or even purple hue, and generally distinct; in some instances the spots cohere, and form an ecchymosis of greater or less extent. These patches are termed *vibices*.

In cases of still greater malignity, carbuncles and gangrenous inflammation of the skin, more particularly on those parts which are subjected to pressure, often arise: and the lymphatics, more particularly the submaxillary, cervical, and inguinal, and in some cases the parotid glands, become inflamed, the cellular substance in which they are imbedded not unfrequently suppurating, and thus forming what some writers have considered a critical abscess. At particular seasons also, erysipelas is very apt to supervene, but more particularly in hospitals, — erysipelatous inflammation rarely supervening on fever among the better classes.

From the peculiar changes which take place in the blood in typhous fever, and to which many pathologists of the present day ascribe all the phenomena, the secretions are more vitiated than in the other forms. This is exemplified in the remarkable fetor of the breath and perspiration, which is so peculiar as to be readily recognised, and in the evacuations from the bowels, which are always exceedingly offensive.

After these general observations, we are prepared to enter on the particular symptoms.

Symptoms of typhous fever. — It has been already stated that a distinction of typhous fever has been made, founded on the difference of intensity of the symptoms. The invasion of the milder form (*typhus mitior*) corresponds very much with that of common fever. The patient complains o giddiness, listlessness, and indisposition to exertion, alternate chills, and hot flushes, with uneasiness or pain at the pit of the stomach. These precursory symptoms are succeeded by pain in the back and loins, burning heat of the skin, flushing of the face, sense of weight in the head or giddiness, noise in the ears, and disposition to quietude. The expression of the countenance indicates intellectual dulness. The pulse is frequent and soft; the digestive organs are deranged; food is disliked; cold acid drinks are relished; the tongue is coated with thin white fur, which becomes gradually thicker and of a brown colour, sometimes it is clean but morbidly red; the mouth is clammy from superabundant secretion of mucus in the throat and mouth; sometimes there is pain in the epigastrium, nausea, and vomiting. Towards the third or fourth day, the symptoms in the brain become aggravated, the head feels more heavy, the mind is more confused; the patient, restless and watchful through the day, becomes delirious at night, while, according to some writers, an eruption of miliary or larger vesicles, with intervening redness of the skin, appears on different parts of the body.

The disturbance in the intellectual powers gradually increasing, the delirium, which was only perceptible at night, is observed to recur at intervals during the day; the hearing becomes dull; the patient more torpid; the answers given to questions evincing hesitation and marked indifference to surrounding objects. About this period epistaxis occasionally takes place; petechiæ appear in different parts of the skin, more especially on the chest, abdomen, arms, back, and thighs. This petechial eruption is not constantly observed in typhous fever, but seems to form an occasional characteristic of some epidemics; and from this circumstance the disease has been termed *petechial fever*. Dr. Stoker states that, of five hundred and forty patients received into the Cork-street Hospital, three hundred and eighty-six had petechiæ. In the London Fever Hospital, the cases now (June, 1832) under treatment have almost invariably the petechial eruption.

These spots or exudations of blood are not confined to the skin, but spread over the serous and mucous membranes; hence, in fatal cases of petechial fevers, the surface of the viscera have been found studded with small bloody effusions.

The condition of the alimentary canal in typhous fever is various, not only in different individuals, but in different seasons and epidemics. Sometimes the bowels are torpid throughout the whole period of the disease; in other cases there is diarrhœa from the beginning, which only disappears with the cessation of the fever. The urine is always scanty and high-coloured, and towards the decline usually deposits a sediment.

This is the usual progress of typhus fever for the first nine or ten days, about which period another train of symptoms appear—those denoting collapse or failure of the powers. This stage is announced by the decline of the previous more acute symptoms—by the pulse becoming more rapid and soft—the tongue dry and brown, often tremulous, and protruded with difficulty—by the incrustation of the teeth with sordes—by the increasing intellectual disorder, indicated by the more constant low muttering delirium, and the greater insensibility and deafness—and by the condition of the muscular system, evinced by muscular tremor and subsultus tendinum, and in some cases irregularity or intermission of the pulse, by the patient lying sunk on his back, or sliding to the foot of the bed, the muscles being unable to support the body, even in the horizontal posture.

From the stage of collapse the patient not unfrequently recovers, the period at which this favourable change takes place being very uncertain; it occurs in some instances about the fourteenth or fifteenth day, but often not till a much later period, depending on the more or less tedious character of the epidemic, and the complications which may have arisen. It is announced by progressive amendment in the symptoms, by the delirium and other symptoms of sensorial disturbance disappearing, the patient enjoying intervals of refreshing sleep; by the countenance improving, and the evacuations being passed consciously, the pulse becoming more slow, the skin cool and soft, and the tongue more clean at the edges, and moist over the body. When these favourable appearances are observed, the convalescence, though slow, is gradually established, the individual, however, remaining in a very weak state for a long time.

The progress of the disease to a fatal termination is indicated by coma, more or less profound, hiccup, retention of urine, or involuntary evacuation of the urine and stools, and tympanitic distension of the abdomen.

A modification of typhus fever has been described by Dr. Armstrong under the name of *congestive typhus*, which, in the opinion of this writer, differs from the more common forms of the disease. This theory presumes that the functions or structure of some important organ are deranged by an almost stagnant accumulation of blood in some part of the venous system. There is no reaction; the system does not recover, or only imperfectly, from the first shock or stage of oppression, the energies of the system being either nearly extinguished by the venous congestions, or so much oppressed as to be unable to create excitement. The local accumulations of blood in the veins are supposed to obstruct, from the beginning, the common series of febrile phenomena; and there is, in consequence, either no morbid heat of skin, or the heat becomes concentrated in some particular parts of the body, while on others it is below the natural temperature. This form, according to this author, is characterized by the sudden invasion, by the overpowering lassitude, muscular feebleness, deep pain, giddiness, or sense of weight in the encephalon; pallor of the countenance; anxious breathing; cool skin; low, struggling, and variable pulse; irritable state of the stomach; mental dulness, apprehension, and confusion, rather than delirium; heavy, suffused eye, as if from intoxication or want of sleep; rough, foul, and dry brown tongue; the bowels, torpid in the beginning, becoming in the advanced stage generally loose; the stools copious and involuntary, and accompanied with inflation of the abdomen. The general torpor causes diminution or suspension of the secretions, and such deficiency of cutaneous excitement, that if blisters be applied, they either do not act at all, or so defectively, as to leave an appearance as if the part had been slightly seared by a heated iron. Petechiæ generally appear earlier in this than in any other varieties of typhus, and in the last stage there are sometimes gangrenous spots on the extremities, oozing of blood from the mouth and nostrils, and hemorrhage from the bowels.

Dr. Armstrong has described several modifications of congestive typhus, all of them recognised by the depressed state of the heart and circulation—the uneasiness in the head—the præcordial anxiety—the peculiar condition of the temperature and skin—the total want of excitement, or its partial and unequal development—the suspended or vitiated secretions—and the local load and general oppression. (Practical Illustrations of Typhous Fever, by John Armstrong, M. D.)

When typhus fever becomes complicated with local inflammation, constituting the *typhus gravior* of Cullen and others, the symptoms from the commencement are more severe, and when the cause of this severity is investigated, it will be found to depend on the inflammation which has arisen either in the brain, in the lungs, or intestines.

1. The cerebral complication is known by the more marked and early affection of the brain—the more deep or severe pain, or sense of weight in the head, giddiness, or oppression—suffusion of the eyes—more constant delirium, and disposition to coma—muscular tremor and subsultus tendinum—soft, rapid, and occasionally intermitting pulse—and involuntary evacuations.

2. There is invariably bronchitis in the more severe cases of typhus. It is generally very obscure, from the absence of the more prominent symptoms, so that if it be not indicated by cough and accelerated breathing, there is nothing to lead to the suspicion of pulmonary disease. The application of the stethoscope, however, will enable the practitioner to discover the bronchitis, sometimes confined to an entire lobe, or in more severe cases extending over both lungs. Not unfrequently, but especially in the winter, and during some epidemics, pneumonia supervenes, and rapidly destroys life.

3. The state of the intestinal canal forms another important feature in the class of fevers under consideration. The symptoms by which the intestinal affection in fever is attended, we have seen to be very obscure; but its existence may be inferred, when the tongue is morbidly red at the point and margins, while the body is dry, fissured, and covered with dry, brown, or black incrustation; when the belly is tympanitic, and there is hemorrhage from the bowels. There may or may not be abdominal tenderness on pressure; more commonly, and particularly when there is much sensorial disturbance, the sensibility is so blunted that the patient does not feel inconvenience even from firm pressure.

[Adynamic fever accompanied by such intestinal lesion has of late years been regarded as an essentially different fever from typhus, and has received the name *typhoid fever*, or *typhoid affection*. It is the *dothinenteritis* already referred to; the *follicular enteritis*, *abdominal typhus*, &c. of authors. By many pathologists it is believed that all continued fevers are divisible into two distinct forms—the *typhoid* and the *typhus*.

In the former, along with symptoms of ataxic adynamic fever, the intestinal affection is generally well marked from an early period. Diarrhœa is one of the most constant phenomena, and is usually present from an early period; but is not always in a ratio with the extent of disease of the intestinal follicles. Meteorism, enlargement of the spleen, rose spots, and sudamina, are amongst the most prominent phenomena; especially the first and third of these. Meteorism is certainly found in a large proportion of cases: at times, it occasions painful distension,—the uneasiness being augmented on pressure; but at others it is so slight as not to be distinctly recognised, except by more or less increased resonance on percussion. It occurs more especially towards the termination of the disease, when, as in other febrile diseases, it is of unfavourable import.

In the large majority of cases, the *taches rouges*, *red* or *rose spots*, are seen most frequently on the lower and middle portions of the chest, and upper part of the abdomen. They are generally of a round shape, and although they do not seem to project above the surface of the skin, they can be felt by passing the finger over it. Their number varies; sometimes there are not more than six or eight, whilst at others they are almost confluent. Their size also varies, but it rarely exceeds that of a pin's head. When the spots are pressed upon by the finger, the colour disappears, but returns immediately afterwards.

To determine whether the meteorism, enlargement of the spleen, *taches rouges*, and sudamina occur equally in other diseases, Dr. Hale, of Boston, (*Observations on the Typhoid Fevers of New England*, &c. Boston, 1839,) constructed the following table:

	TYPHOID FEVER.		OTHER ACUTE DISEASES.	
	No. Cases.	Per cent.	No. Cases.	Per cent.
Whole number	197		159	
Meteorism	130	66	9	6
Spleen felt	19	9	0	0
Rose spots	177	90	0	0
Sudamina	75	38	8	5]

Morbid Anatomy of Continued Fever.—Though morbid anatomy has not yet unfolded the true nature of fever, more sound views of its pathology and treatment have been obtained, by comparing the symptoms during life with the morbid appearances found on dissection. Before examining the morbid appearances in each organ, it is necessary to premise, that in some instances of sudden and early death from fever, no changes of structure sufficient to account for the fatal issue have been discovered. We are to conclude, therefore, that in these cases the duration of the febrile excitement had been too short to produce any appreciable alteration of structure in any organ.

1. *Morbid appearances in the Brain.*—The *dura mater* is scarcely ever altered in appearance, though in some cases a small quantity of serous fluid has been found between this membrane and the arachnoid. Louis observed in one case the inside of the dura mater lined with a thin pseudo membrane.

In the majority of cases, the *arachnoid membrane* exhibits traces of previous inflammatory action; it is sometimes simply vascular, in other cases thickened and opaque, with more or less effusion between it and the pia mater. The fluid varies in colour and consistence. It is generally transparent and colourless; but in instances in which the previous inflammatory action has been more intense, it is opaque, of a light straw colour, and of greater consistence, approaching to the nature of coagulable lymph.

In the ventricles there is generally a small quantity of serous fluid, varying from one or two drachms to half an ounce; it rarely amounts to an ounce.

The vessels of the *pia mater*, which often adheres in points to the arachnoid membrane, are generally more numerous, distended, and tortuous than in the natural state of this membrane, especially in those cases in which the other parts of the brain exhibit traces of vascular turgescence. According to Louis, the injection of the pia mater is greatest in the rapidly fatal cases, and serous effusion in those of which the progress has been more slow.

The consistence of the *substance of the brain* in fever is variable; sometimes it is extremely soft, so that it lacerates easily; in other cases it is unusually firm. It is difficult to determine how far these opposite states indicate of themselves the previous existence of inflammation. Louis does not seem inclined to believe that either condition is to be considered as the result of inflammation, as the change is uniform throughout the whole brain, and the symptoms during life do not bear an invariable relation to the appearances in the brain after death.

Injection of the substance of the brain is not unusual, the vascular turgescence being observed in a larger proportion of cases in the medullary than in the cortical portion. The blood-vessels are not only more distended, but more numerous, as may be observed on making a section of the brain so as to expose the centrum ovale, when numerous bloody points, the orifices of divided arteries, are interspersed, giving the section a dotted appearance.

The *cerebellum* seldom exhibits any alteration, if we except that of the membranes at the base of the brain, and the effusion with which it is frequently associated. A slight degree of softness of its substance has in some cases been observed.

The *spinal cord* has not undergone that minute investigation which would enable us to speak with certainty as to its general state in fever. When the medulla oblongata is divided, so as to allow the removal of the brain, a quantity of serous fluid escapes from the vertebral canal in those cases in which there has been considerable effusion in the ventricles. The membranes which envelope the spinal cord have been occasionally found vascular, the substance of the medulla spinalis being at the same time injected and softened.

With regard to the proportion of cases of fever in which lesions of the brain have been discovered after death, Louis, in his recent work, states that besides the case in which the inside of the dura mater presented a thin pseudo-membrane, in *four* there was a little fluid between the dura mater and arachnoid; in *more than half*, the sub-arachnoid cellular tissue was infiltrated with serosity, and in *one half* the pia mater was injected with blood. In *three-sevenths*, the cortical substance was redder than natural; in *six-sevenths*, the medullary matter was injected,—these latter appearances being most striking when death took place at an early stage; in *six* cases, the density of the brain was slightly increased; in *five*, it was diminished. Of fifty-four cases examined at the London Fever Hospital, thirty-seven exhibited evident traces of previous inflammation of the brain.

2. *Morbid appearances in the chest.*—The structure of the *larynx* in fever is generally healthy, unless, as occasionally happens during the period of convalescence, laryngitis or tracheitis supervenes. In the former case, the glottis is found contracted in consequence of œdematous swelling or serous infiltration of the submucous cellular tissue of the epiglottis, or rima glottidis: sometimes the larynx is lined with a thin layer of recent lymph, extending into the trachea. In the latter, the peculiar membrane of croup is observed.

Inflammation of the *pharynx*, followed by abscess, occasionally takes place, and when the purulent collection occurs in the vicinity of the glottis, the pressure gives rise to the ordinary symptoms of laryngitis. We have known these cases terminate fatally.

In examining the state of the *lungs*, it is necessary to guard against a source of fallacy. The blood appears chiefly in the posterior portion of the lungs; this circumstance has given rise to the idea that the patient had pulmonary engorgement during life. This pseudo-morbid appearance is readily produced by the gravitation of the blood after death, favoured by the position of the body; indeed, were the body placed immediately after death in any other, we should find a similar congestion in the portion of lung which is most dependent.

When bronchitis has existed during fever, the *mucous membrane* exhibits more or less vascularity; this is most perceptible in the trachea and larger bronchial tubes, though, perhaps, throughout the whole extent of one lobe, the bronchial membrane has a more or less dark red swollen appearance, very different from the pale pink colour observed in its healthy state. When the symptomatic bronchitis has been severe, the bronchial membrane of both lobes appears red, and often considerably swollen and thickened, while the smaller tubes are filled with mucus or muco-purulent fluid.

In fatal cases of fever complicated with pleuritis, adhesions between the *pleura pulmonalis* and *costalis*, with or without effusion of coagulable lymph on the inflamed surfaces, are the usual morbid appearances. Sometimes there is effusion of serous fluid into the pleural cavity, the fluid being frequently mixed with portions of coagulable lymph, which render it more or less turbid.

When the *substance of the lung* has been inflamed, the appearances vary according to the intensity of the pneumonia. When the fever proves fatal in the first stage, the lung is increased in density, and infiltrated with serous or bloody fluid. When it has proceeded to the second stage, it is solid and dense, and no longer crepitates. In a still more advanced stage, the pulmonary structure assumes a granular appearance, and pale yellow colour, from purulent infiltration. In some instances that peculiar lesion known by the term *pulmonary apoplexy* has been observed.

Lesions of the *heart* are very rarely observed in fatal cases of fever. In some instances, but more especially in the fevers of hot climates, which run on to a fatal termination with great rapidity, the muscular structure has been found softened and attenuated so as to be easily lacerated. Louis states that this affection was uniformly greatest in the instances of rapid death, and was invariably conjoined with a hurried, fluttering, irregular and feeble pulse. This softening is generally confined to the left side of the heart, though sometimes both sides have been found affected. Other morbid changes have also been observed, but in those instances the organic disease has always been of long standing, the fever having supervened in the progress of the cardiac affection.

The internal membrane of the *aorta* and some of the *larger arteries* occasionally exhibits a bright red colour. This redness, which occurs in patches of various sizes, is not the product of inflammation, but only the effect of *staining*. This has been proved by the fact, that this appearance may be easily produced by filling a portion of a large artery with blood, and confining it by means of ligatures. Some pathologists have mistaken this staining for arteritis.

3. *Morbid appearances in the abdomen.* The occasional occurrence of abscess in the submucous cellular tissue of the pharynx in fever has been already mentioned. The *œsophagus* is generally unaffected. Some writers have alluded to superficial ulcerations in both the pharynx and œsophagus. Such morbid appearances however are to be regarded only as occasional secondary affections.

The alterations which take place in the *alimentary canal* are chiefly in the mucous membrane, and follicles of the small intestines.

When the cavity of the abdomen is laid open, the stomach and colon are in the majority of instances considerably distended with flatus—the diameter of the small intestines, particularly in those portions where there are lesions, being contracted, and of a dark colour.

On examining the internal mucous coat of the *stomach*, it occasionally exhibits some deviation from the healthy state. Louis affirms that in thirteen of forty-six cases examined, the stomach was quite healthy in colour and consistence. In some instances it is injected in patches of various extent; in others, it is partially and sometimes generally softened and attenuated, so that the mucous membrane is easily detached from the subjacent cellular tissue.

In a few instances, ulceration of the stomach has been found. This occurs in a larger proportion of cases in the fevers of France than in those of Great Britain. Andral states that ulceration of the stomach occurred in one-tenth of the cases examined by him at the Hôpital de la Charité: Louis found this lesion in one-twelfth of those he inspected at the same establishment. In the Fever Hospitals of Britain, this lesion is scarcely ever observed, though we find in many cases appearances indicative of previous inflammatory action in the mucous membrane, viz. redness and softening.

It is seldom that the mucous membrane of the small intestines is sound through its whole extent. The *duodenum* rarely exhibits any trace of disease, and may, therefore, be considered less frequently affected in fever than any portion of the alimentary canal. In the remaining portion of the small intestines (*jejunum* and *ileum*) we find more uniform lesions; in the more rapidly fatal cases, or when the whole force of the disease has centred in another organ, the mucous membrane retains the natural pale pink colour. In general, however, we observe portions of a greater or less extent, uniformly reddened, the tinge differing from a light red vermilion to a deep brown. The redness is usually deeper in the valves than in the intervening spaces, so that if these valves be drawn out, the intensity of the colour very much diminishes or altogether disappears. This red injected appearance of the villous surface of the intestines is generally followed by intestinal hemorrhage. Sometimes, instead of this uniform redness, the membrane is studded with clusters of small red points or dots, which apparently arise from injection of the capillaries, or in some instances from effusion of blood beneath the mucous membrane. The red colour of the membrane, however, is by far the more common appearance, and is more uniform and extensive in the portion of the ileum adjoining the cæcum: it varies in extent in different subjects, often extending for several feet, occasionally over one-half, or even the whole of the small intestines. In the more advanced stage of inflammation of the mucous membrane, the colour assumes a grey tinge, and when this is observed, it always indicates protracted fever. Louis states that he scarcely ever saw the grey colour of the mucous membrane in persons who died before the twentieth day of fever, more generally in those who died from the twentieth to the thirtieth day, or even at a still more advanced period of the disease; hence it has been supposed that the grey colour occurs when the redness of inflammation is passing off, and the mucous membrane is about to resume its healthy colour.

The consistence of the mucous membrane of the intestines is not always uniform. In the majority of instances it retains its natural consistence; in other cases the inflammation produces thickening and pulpiness of the mucous coat. Though softening has been observed in a small proportion of cases only, it is more frequently met with than thickening, and has been more particularly remarked when the fever had been long protracted. It does not, however, appear to be the necessary consequence of inflammation, as it occurs in some cases without redness; that it occurs with both redness and thickening of the membrane, cannot be denied; but as it is more frequently noticed without either of these conditions, we must conclude that, although we are unable to explain the precise circumstances under which softening of the mucous membrane of the bowels arises in fever, it is not the product of inflammation. We know that it may be produced very soon by corrosive poisons. Mr. Brodie found the stomach of a dog, to which two grains of the oxymuriate of mercury had been given, remarkably softened half an hour after the poison had reached the stomach.

Besides these morbid states of the mucous membrane, vegetations of a red or brown colour, and of extremely soft consistence, are occasionally met with. They lie one above the other, projecting perhaps three or four lines above the surrounding membrane: they are not very common. We have seen only one case at the London Fever Hospital, and in this subject the vegetation occurred in the lower portion of the ileum. Andral states that he met with them only in the large intestines. Orfila met with a considerable number in the stomach of a person who had taken cantharides.

The tendency of inflammation of the mucous membrane of the intestines to pass into ulceration, has been observed by every modern pathologist who has examined the various lesions which arise in the progress of fever.

These ulcerations in some cases succeed to simple inflammation of the villous coat, in which case the ulceration takes place in one or two points, generally in the centre of the inflamed patches; these points become by degrees more numerous and extensive, and at length coalesce so as to form a patch of greater or less extent. The same process may be going on in different portions of the membrane at the same time; and if it happen that the ulceration commences in contiguous portions of the bowel, one or more patches often cohere, and thus form an ulcer of considerable size.

The most common form of intestinal ulceration, however, is that which succeeds to inflammation of the mucous follicles of Peyer and Brunner. These follicles or glands, which in their natural state are very minute, vary in number and size in different situations. At the pyloric extremity of the stomach they are numerous, but distinct or isolated; hence called *glandulæ solitariæ*, or after the anatomist who first particularly described them, *glandulæ Brunneri*. They gradually diminish in number towards the extremity of the duodenum, in which situation they are larger and more apparent than in any other portion of the bowels. In the jejunum and ileum they become more numerous and form into groups; hence they are called *glandulæ agminatæ* or *Peyerii*, (Peyer being the anatomist by whom they were first observed.) They become exceedingly numerous towards the lower third portion of the ileum.

The greater vitality of these follicles, compared with other parts of the mucous membrane, renders them peculiarly liable to inflammation and disorganization; hence we find that, according to the stage of fever, hypertrophy, redness, and ulcerations of these follicles are the only morbid appearances. M. Bretonneau has distinguished this form of intestinal inflammation by the term *dothinenteria*, (from δοθιην, *pustula*, and ἔντερον, *intestinum*.) The glands of Brunner are less frequently diseased than those of Peyer, and if the statement of Louis be correct, viz., that, in other acute diseases, inflammation of the villous coat, as well as enlargement of the mucous crypts or glands of Brunner, are not unfrequently observed, though not so commonly as in fever, but that disorganization of Peyer's glands are never met with, except in some forms of fever, the changes which take place in these follicles (*glandulæ agminatæ*) may be admitted to be peculiar to certain types of fever, and to constitute their true pathology.

With regard to the situation of these ulcerations, it may be stated that they occur in every part of the intestinal canal, from the cardiac extremity of the stomach to the rectum. They occur, however, more frequently in some portions of the bowels than in others. For instance, they are comparatively infrequent in the stomach, still more rare in the duodenum and jejunum; the most common situation is in the lower third portion of the ileum. In the colon they are occasionally found, though less frequently than in the small intestines.

From the following table drawn up by Andral, an idea may be formed of the relative frequency of intestinal ulceration in different parts of the canal.

Seat of Ulceration.		Number of Cases.
Stomach		10
Duodenum		1
Jejunum		9
Ileum (lower portion of)		38
Cæcum		15
Colon	Ascending	4
	Transverse	11
	Descending	3
Rectum		1
Total		92

The ulcerations also vary in several particulars, especially as to number, aggregation, size, and shape. In the stomach there is in general only one solitary ulcer, seldom more than two. In the lower portion of the small intestines they are more numerous, and situated nearer each other than in the upper, in which situation there is often a considerable distance between them: in the ileo-cæcal valve they are generally so closely situated as to form a large patch of ulceration; they are less confluent in the cæcum. As to size, some are not larger than an ordinary pin-head; the more general size is from a split garden-pea to half a crown; but between these sizes there is every intermediate gradation, the structure of the intestine being sometimes completely destroyed for several fingers' breadth above the cæcum, where the largest ulcerations generally occur.

The form or shape of these ulcerations is also various; some are oblong, having their greatest diameter according to the length or breadth of the intestine; sometimes they are circular, occasionally linear. Their number, size, and depth depend on the duration of the fever. In general, when patients die within the first fourteen days, the disease in the mucous membrane, or in the follicles, has not advanced to the stage of ulceration, though from every appearance this subsequent stage would soon have taken place.

When the ulcerations are numerous, large, and deep, we may presume that the fever is of considerable duration, — that it has advanced beyond the third week. In the same portion of intestine, too, every successive change may often be observed: thus we find in one part the mucous membrane red and swollen; in another, the mucous follicles enlarged; in a third, abrasion of the membrane or follicular ulceration.

Sometimes these ulcers extend chiefly in breadth, but more frequently in depth, destroying in succession the coats of the bowel. When the diseased process has commenced in the follicles, a small spot of ulceration is observed on their summit; the ulcers then gradually extend both in breadth and depth, so as to expose the muscular coat, which then becomes the floor of the ulcer: in process of time the muscular coat is destroyed, the peritoneal covering alone remaining; and should the patient survive, this becomes gradually thinner by ulcerative absorption, and at length gives way, constituting *intestinal perforation:* the escape of the contents of the bowels through the aperture being followed by rapid peritonitis and death.

The symptoms which indicate intestinal perforation are sudden excruciating pain and increased distension of the belly; sometimes vomiting; small, rapid, feeble pulse; shrinking of the features; cold sweats; and death follows generally within thirty-six hours, though some individuals have existed for a longer period.

When the brain has been much affected, the patient is so insensible as not to feel pain in the abdomen, even when the perforation takes place: in such instances it may be suspected from sudden alteration in the features, rapid distension of the abdomen, and small contracted quick pulse. In some instances, the adhesion of the portion of the intestine, at the point where the ulcerative process is going on, to some adjoining viscus, has prevented the peritoneum giving way, and the consequent effusion of the intestinal contents into the abdominal cavity.

It appears, as we have already observed, that intestinal ulceration is more common in the fevers of France than in those of Britain, and that they occur more frequently at some seasons than at others. It is probable, too, that they are found in a larger proportion in populous places, as in the large towns, than in villages or the open country. Of fifty-four cases examined at the London Fever Hospital, (1828–1829,) intestinal ulcerations were discovered in sixteen; and in ninety-two cases of two hundred and twenty-nine treated at La Charité by Lerminier. On what this difference depends, it is not easy to determine.

With regard to the cicatrization of intestinal ulcers, there is now no longer any doubt that this reparative process does take place. Besides the well-authenticated example in the case of the late celebrated Beclard, in whose stomach a cicatrized ulcer was discovered at the small curvature, we have the testimony of Troillet, Louis, and other pathologists, on this point; and though we ourselves have never witnessed an unequivocal instance of genuine cicatrix, the minute detail, by those writers, of the various stages observed during this process, and their accurate description of the appearance of intestinal cicatrix, leave no longer any doubt on this subject; but from the want of diagnostic symptoms to indicate the existence of intestinal ulceration, it cannot be determined in what proportion of cases this reparative process takes place. It is probable, however, that it is a rare termination of such lesions.

[It has been already remarked, that the intestinal affection has been regarded as characteristic of one form of continued fever, the *typhoid.* By some pathologists, indeed, it is considered as the precursor and cause of all the other morbid phenomena. It does not, however, appear to be entitled to the importance in the causation that has been ascribed to it. All the phenomena may occur without the intestinal lesion; and the latter may exist without being indicated by the ordinary symptoms of the typhoid affection. Hence, objections may well be urged against classifying typhoid fever amongst the diseases of the digestive tube, as has been done by Andral, Piorry, and others.

It is difficult to comprehend, that these follicles can be so intimately associated in their morbid derangements with the great vital organs, as to occasion the ataxic and adynamic fever, which has been ascribed to them. The follicular affection would appear, indeed, to be a mere symptom, and to be produced by the same cause that gives rise to the other symptoms of typhoid fever; but which cause, in the existing state of science, is inappreciable. As elsewhere remarked, (*Practice of Medicine,* 2d edit. ii. 503,) the writer is not prepared to admit, from what he has himself seen, and from a careful examination of the testimony of others, that the typhoid affection and typhus are proved to be separate and distinct diseases. He regards them both as forms of adynamic fever, exhibiting different phenomena under different circumstances; generally, in the United States and in France, the abdominal lesion being present, whilst in England it is as commonly absent; and it is strongly in favour of this view of it, that since attention has been more directed to the represented difference between the affections in Great Britain, it has been shown, that the follicles are not unfrequently diseased in the ordinary continued fever. (Watson, *Lectures on the Principles, &c., of Physic,* Amer. edit. p. 844, Philad. 1844.) In this country, too, epidemic adynamic fever has been described, in some cases of which the glands of Peyer were diseased; in others not. (*Western Journal of Medicine and Surgery,* 1843.) The singular forms of adynamic fever, which have prevailed, of late, in different parts of the Union, also exhibit the wide difference of expression which it may assume.]

The *colon,* in fatal cases of fever, is considerably distended with flatus; it appears to be the portion of intestine in which tympanitic distension usually occurs.

The internal or mucous surface sometimes exhibits evidence of previous inflammation in the red, softened, or thickened state of this membrane. The mucous follicles are occasionally enlarged; and ulcerations, chiefly in the cæcum, are now and then observed.

The *mesenteric glands* are almost invariably diseased: when there is no intestinal ulceration, they are simply enlarged and indurated; when ulceration of the bowels has taken place, these glands, besides being enlarged, generally contain pus.

The *external absorbents,* especially those situated in the neck, axilla, and groin, are occasionally enlarged and indurated. In some epidemics parotid buboes are not uncommon, indicating a malignant form of fever.

The only alteration in the *liver,* which may perhaps, be deemed peculiar to fever, is softening; and this is only occasionally observed. In those instances, it is of a pale colour, and so soft as to be very easily lacerated.

The *spleen* is very generally altered in structure in fever. This alteration consists in unusual softness, in some instances to such a degree that the organ is reduced almost to a pulp, and breaks down on the slightest pressure: it is generally accompanied with enlargement, though seldom to any considerable extent, while its colour is changed to a very dark purple or a reddish black.

This softened state of the spleen has been observed in every stage of fatal cases of fever; in those who perish early, as well as in those in whom the disease is more protracted; it does not appear to have an inflammatory origin, since its capsule is generally sound. From this extreme softness in some forms of fever, more especially typhoid fever, and in diseases of putrescency, such as scurvy, it is probable that a morbid condition of the fluids has a peculiar effect on the structure of this organ, though we know of no symptoms which indicate this particular lesion.

In one case which came under the care of the writer of this article, at the London Fever Hospital, a small circumscribed abscess was found in that portion of the spleen which is connected with the diaphragm. In this instance symptoms of pleurisy of the left side arose in the progress of fever, which did not yield to the ordinary treatment. The patient eventually died; and on dissection, a small tumour of the size of an egg was observed in the centre of the diaphragm, which gave at first the idea of diaphragmatic hernia. On more close inspection it was discovered to be an abscess in the spleen, which had formed an attachment to the diaphragm, through which it had so far penetrated as to be covered only by the thin transparent pleura. It appeared just about to burst into the left side of the chest. The general structure and size of the organ were otherwise healthy.

Pathology of the Fluids in Fever.—That the fluids are changed in fever is evident from the altered state of the various secretions, as well as from certain appearances which have been observed in the blood itself. This subject, though of the utmost importance, has been hitherto almost entirely neglected, probably in consequence of the pathologists of the present day being more disposed to investigate the morbid changes which take place in the solids, and consequently to trace the causes of the phenomena of fever to disease in them, rather than to any alteration in the blood itself.

The doctrines of humoral pathology which prevailed for many centuries were not founded on direct experiments, but on vague conjectures, from observation of the constant and uniform vitiation in the fluids. Chemical analysis in those days had not attained the perfection necessary to detect the various changes which the blood and fluids were supposed to undergo; and, in later times, the acknowledged difficulty of such experimental inquiries, with the zeal with which morbid anatomy is cultivated, will account for the slow progress of this department of pathology.

That the blood does undergo changes in fever was always conjectured: that certain changes precede its development, and that certain alterations in its component principles do arise in its progress, is not only highly probable, but, as has been already stated, some modern pathologists do not hesitate to affirm that a vitiated state of the blood is the origin, source, or proximate cause of the disease.

It has been often observed by practical physicians, that the blood drawn from persons labouring under fever differs according to the type and the duration of the disease. In cases which bear the inflammatory character, the coagulum is firm, the fibrine abundant, or in greater relative proportion to the water and albumen: in some instances the coagulum is so dense that little or no serum is separated. This condition of the blood may or may not be accompanied with a buffy coat.

There appears, however, in the progress of fever, to be a gradual diminution of the fibrinous principle; the coagulum being not only small in proportion to the serum, but of a loose soft texture. Upon what this diminution of the fibrine, and of the force of aggregation by which its particles are kept together, depends, neither physiology nor chemistry has yet discovered; all that in the present state of medical science we do know on this point, are the facts stated. Dr. Clanny has endeavoured by well-contrived experiments to determine with accuracy the relative loss or diminution of fibrine at the various periods of fever, and certainly his investigations on this curious subject deserve attention. (Lecture on Typhus Fever.)

[The examination of the blood drawn in the typhoid affection has not led to any decisive results. It was affirmed by M. Bouillaud that it does not resemble that of any other disease; but this is denied by M. Louis. It would seem, however, from the observations of MM. Andral and Gavarret and M. Raciborski, that it is generally less coagulable than in other morbid conditions. The quantity of fibrin is certainly decreased. (Andral, *Hématologie Pathologique*, Paris, 1843; or Amer. translation by Drs. Meigs and Stillé, Philad. 1844.]

The changes which take place in the secretions in the progress of fever, and which are so evident to the senses, depend in some measure on the general disturbance which takes place in every organ of the body, as well as on the condition of the blood. It is evident that if this fluid, from which all the secretions originate, be in a morbid state, the fluids which are eliminated from the parent source, must likewise be in an unhealthy state. The changes which the individual secretions undergo in fever have not been ascertained by chemical experiment, the knowledge we have of their vitiation being derived exclusively from observation.

Crisis of Fever.—From the earliest periods of medicine, the termination of acute diseases, more especially fevers, was observed to be preceded or accompanied by certain appearances or symptoms which indicated a favourable or unfavourable termination of the malady. Hence the origin of the term *crisis* (from κρίσις, judgment), and the days on which these changes occurred were called *critical days*.

The crisis was regarded as salutary when an evident amendment or complete cure accompanied or followed the change; *perfect* when there was an entire cure of the disease; *imperfect* in the case of simple amelioration; and false when certain appearances, such as hemorrhage, petechiæ, colliquative sweats, inflammation of the parotids, and carbuncles appeared, as these only portended a more dangerous and probably fatal form of fever.

Those who embrace the humoral pathology of fever imagine that the termination of the symptoms is produced by some great effort of the system to relieve itself, following the Hippocratic doctrine, that there being always a morbid matter to be expelled, nature was ever endeavouring either to attenuate this supposed morbific material, or to discharge it from the system. The solidists on the other hand contend that the solution of fever is effected by the treatment applied to the local affection, of which the fever is supposed to be symptomatic. Without entering into this discussion, we may observe that the crisis of fever often takes place without sensible evacuation: in a large proportion of cases, however, it is preceded or accompanied by some change in the secretions, or by diarrhœa or hemorrhage.

The urine is well known to exhibit certain alterations in the progress of fever. In the early stages it is diminished in quantity, but without any change in its colour or chemical properties. As the symptoms advance, the urine becomes darker in colour, but does not deposit a sediment till the fever begins to decline, when it is increased in quantity, and deposits a cloud or sediment on cooling. This urinary deposit, which is sometimes copious, appears in the bottom of the vessel some hours after the urine has been voided: from its resemblance to brickdust it has been called *lateritious,* and by evaporation may be collected in minute crystals of lithate of ammonia. This sediment is by no means peculiar to patients labouring under fever, but is often observed in the urine of healthy persons, or in those whose function of digestion is impaired. In other instances the sediment is of a pinkish white colour, and to this deposit, which according to Dr. Wilson Philip consists of the phosphates of the urine, the term *furfuraceous*, or *branny*, has been given. He regards both these urinary deposits as indications of returning health, and particularly of the renewal of a free secretion by the skin, which in fevers is generally a favourable symptom. In some fevers terminating favourably, there is an unusual tendency to sweat which only exhausts the strength. In these the furfuraceous sediment is observed, but without removing the fever. This is the case in hectic fever.*

The connection of the favourable termination of fever, more especially intermittents, with free perspiration, was so often remarked by the ancients, that it gave rise to the practice of treating the disease by means calculated to induce diaphoresis, a practice which was followed by the most injurious consequences. They believed the abatement of the symptoms to be entirely owing to the free action of the vessels of the skin; and that consequently, if sweating could be induced, it would have a salutary tendency. On this point it is only necessary to observe, that however beneficial moderate spontaneous perspiration undoubtedly is, permanent abatement of the febrile symptoms seldom follows diaphoresis when artificially induced. When the sweating is so profuse as to induce exhaustion, or when it is partial or clammy, it is unfavourable; and though as a general rule, when critical sweats appear, little should be done, if the strength be evidently lowered, or if there be not corresponding amendment in the general symptoms, they should if possible be checked.

It is remarkable, however, that in those kinds of fever in which there is great weakness, profuse long-continued sweating has been often observed to be most salutary. We are informed by Dr. Donald Monro, that in the petechial fever sweating often continued with the best effects for three or four days. Hoffman also observed, as a peculiarity of this fever, profuse cold sweats of an acid smell, continuing for days and nights, and proving (apparently) a salutary crisis.

When moderate diarrhœa comes on towards the termination of fever, it is generally a favourable circumstance, and ought not to be interfered with. When there has been a disposition to relaxation of the bowels throughout the disease, which is not uncommon in some epidemics in which gastric symptoms predominate, or at particular seasons, the irritation commonly subsides spontaneously; should it even continue through the period of convalescence, provided it do not interfere with the recovery of the patient, it is only necessary that the diet and general management be duly regulated. When the diarrhœa appears to retard recovery, and produce gradual emaciation, the practitioner should never lose sight of the possibility of the affection being the result of inflammation of the mucous membrane of the bowels, or of other intestinal lesions, and therefore requiring the most vigilant care. From these observations it appears, that although diarrhœa does occasionally come on towards the close of fever, and in such instances may be said to be critical, yet no positive conclusions can be drawn from this symptom—that when moderate it may be salutary, when excessive it retards recovery, and in many cases appears to indicate some of those intestinal lesions which generally prove fatal.

Though critical hemorrhages are mentioned by many of the older authors as occasional occurrences in fever, we confess that in our individual experience we have never witnessed such a crisis of fever. The inference is, that the occasional hemorrhagic action (more common in the fevers of hot countries) which has been observed in some cases to take place spontaneously, and to be followed by a salutary effect, has been improperly termed *critical.* We have repeatedly observed such spontaneous hemorrhage from the nose when there was considerable cerebral affection, and always remarked the great relief which followed this salutary evacuation; but we have never met with an instance in which the fever disappeared with the epistaxis. In typhus fever, hemorrhage from mucous surfaces and from the skin (petechiæ) at any period of the disease, but more particularly in the advanced stages, is not unusual. These hemorrhages are never critical; they tend to lower the already exhausted powers of the patient, and always indicate an unusually severe, if not a fatal form of fever.

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* Dr. Wilson Philip states that the following are the only appearances of the urine, if we except those it assumes in consequence of morbid affections of the urinary organs, which can be distinctly marked:—the pale urine without cloud or sediment—the pale urine with a slight cloud appearing a few hours after it has been passed—the high-coloured urine remaining clear, or having a light cloud formed in it, and depositing usually, a considerable time (from four to twelve hours) after it has been passed, a red crystallized sediment—the high-coloured urine becoming turbid after it has been passed for a short time (from half an hour to two hours), and depositing a light-coloured, sometimes pinky sediment, now and then (after the urine has stood for a longer time) mixed with more or less, if the light-coloured sediment is copious, never with much, of the red crystallized sediment. In almost every disease, as well as in health, the urine occasionally assumes all these appearances.

Enlargement of the absorbents (more especially of the cervical and parotid glands) occasionally takes place towards the termination of fever. This is more common in some epidemics than at other times, and though resolution generally takes place when the inflammation extends to the cellular tissue surrounding the gland, it terminates in suppuration. Abscesses occasionally form in different parts of the body towards the decline of fever, and have therefore been regarded as critical.

Eruptions of the skin have also been observed towards the decline of fever. The appearance of aphthæ on the tongue, lips, and inside of the mouth, has been thought an unfavourable circumstance in fever, as indicating debility. Though we do not think the supervention of any eruption a desirable event, we have never observed an unfavourable result in such cases as have been accompanied with aphthæ.

Herpes about the mouth and ears towards the termination of fevers is to be regarded as a salutary crisis.

The ancients also believed that fevers had a fixed or determinate duration, and that these terminations happened on certain days in preference to others. The days on which continued fevers are said more particularly to subside, are the third, fifth, seventh, ninth, eleventh, fourteenth, seventeenth, and twentieth. De Haen collected from the writings which have been supposed to be the productions of Hippocrates, the results of the termination of one hundred and sixty-three cases of fever. Of these it is asserted that more than two-thirds terminated on one or other of the eight days above mentioned; none occurred on the second or thirteenth day, and only one-third of the whole terminated on the eighth, tenth, twelfth, fifteenth, sixteenth, eighteenth, and nineteenth days.

Of one thousand seven hundred and seventy-three cases, of which an account of the days of decline was kept by Dr. Stoker, two hundred and sixty-two occurred on the seventh day, two hundred and twelve on the ninth, one hundred and seventy-three on the eighth; on the fifth, sixth, tenth, eleventh, and twelfth, nearly an equal number, (about one hundred and twenty;) from the thirteenth to the thirty-first days, the number pretty uniformly decreases from eighty-two to two.

From the difficulty of ascertaining the actual commencement and decline of the symptoms of fever with accuracy, besides that the disease is more protracted in its duration at some periods than at others, we are not inclined to consider these observations of much practical value.

Not only did the ancients suppose fever terminated at certain determinate periods, but Galen affirmed that, after careful observation, he had been able to discriminate those days on which fever terminated favourably or unfavourably. Thus he asserted that the majority of fevers terminated favourably on the seventh day, a large proportion on the fourteenth: next in order he placed the ninth, the eleventh, the twentieth, or twenty-first, the seventeenth, the fifteenth, the fourteenth, the third, the eighteenth, the twenty-seventh or twenty-eighth. The sixth day, according to Galen, was always most unfavourable, fevers which terminated on this day being either in general fatal, the crisis imperfect, or the patient liable to relapse. Other unfavourable critical days were the eighth, the tenth, the twelfth, the sixteenth, and the nineteenth. The thirteenth was regarded as neither favourable nor unfavourable.

We do not enter into these details of supposed critical days, with the most distant wish to perpetuate what certainly appears a fiction, but to endeavour to guard the inexperienced against doctrines which deserve notice only from their antiquity.

It should be remembered that we have no grounds for ascertaining how time was calculated in those early days; besides the difficulty of ascertaining the precise hour or period of invasion, and the time occupied by the gradual and often imperceptible changes which announce the crisis. We know also that the duration of fever varies according to climate and the particular character of the epidemic: besides, we have endeavoured to show that there are, comparatively, very few cases of fever in which some local inflammation does not exist at the beginning, or arise at some period of its progress, and which most materially interferes with any supposed regular duration.

It must be apparent, also, that the symptoms of fever may be not only mitigated, but their duration shortened, according to the treatment which has been adopted: indeed, fever is often rendered exceedingly tedious, either from neglect in its early stage, or from the sufferer being placed under circumstances which preclude the possibility of those means being applied which are most effectual in checking the progress of the disease.

These remarks are intended to apply to the various forms of continued fever. We admit that in periodic fevers the symptoms have a certain duration, and that in the eruptive fevers, (small-pox, measles, and scarlatina,) the symptoms have also a fixed period of cessation or decline, unless their regular course be interrupted by the supervention of some local affection, or some peculiarities in the epidemic itself. These circumstances certainly, at first sight, give countenance to the doctrines we are now impugning; but when we consider the many circumstances in which eruptive fevers differ from every other form of acute disease, their almost invariably fixed duration cannot be adduced as an argument in favour of the doctrine of critical days in continued fever.

Prognosis.—Although a considerable proportion of cases of fever recover, it is to be regarded as a dangerous disease. For the first few days its character may be mild, but symptoms often arise in its progress which place the patient unexpectedly in danger; while, on the other hand, the patient may recover from a combination of the most unfavourable circumstances.

In the first place, the prognosis will depend on the type of the fever, and the complications which arise in its progress. Simple fever, being the mildest, is the least dangerous form; indeed it seldom proves fatal, unless from the supervention of some local inflammation. Of the probable issue of complicated fevers, it may be said that this depends both on the importance of the organ affected, and the intensity or degree of the local disease.—Cerebral is more dangerous than pulmonary or abdominal inflammation; and the various intestinal lesions are more dangerous than any form of pulmonic affection. If there be local disease in more than one organ, the prognosis must, of course, be less favourable than when the affection is confined to a single organ.

Of the prognosis of typhus fever, it may be stated that it is the most dangerous form of fever. Its fatality is materially influenced by the symptoms which arise, by the character of the prevailing epidemic, and the mode of treatment pursued. Indeed, every species of fever varies in severity in particular years, and even in particular periods of the same year. It is not easy to account for such variation in epidemics, nothing beyond the fact having been hitherto ascertained.

In the second place, the prognosis will also, in some degree, be influenced by the age of the individual. It is more fatal at some periods of life than at others. The following table will give a comparative view of the mortality of fever at different ages. It is abstracted from the records of the London Fever Hospital.

Under 10 years of age there died	14
From the age of 10 to 15	40
15 to 20	118
20 to 25	84
25 to 30	73
30 to 35	25
35 to 40	39
40 to 45	30
45 to 50	29
50 to 55	14
55 to 60	12
60 to 65	6
65 to 70	9
70 to 75	5
75 to 80	2
	500

In the third place, the constitutional powers and previous habits of the individual will also materially influence the probable result of the case. Persons of a robust vigorous frame and sanguine temperament in general pass through fever better than those of a melancholic temperament and feeble powers; and those who have led a temperate life are more likely to escape the ravages of fever than such as have impaired their constitution by intemperance and excess.

In the fourth place, particular symptoms indicate a favourable or unfavourable prognosis. In acute diseases, and more especially in fevers, it is of great consequence to examine into the various conditions of the pulse. In fever we are to be guided chiefly by its frequency and volume. If it do not exceed 100 or 110 at any period of the twenty-four hours; if it be at the same time soft though not very compressible, and if the pulsations be regular, the indication, so far as the circulation is concerned, may be considered favourable.

The state of the respiration is also to be considered. If it be of natural frequency, or only a little accelerated towards evening, or at those periods of the day when an accession of fever comes on, resuming its natural state when the exacerbation abates, and is not attended with cough, it is favourable. Auscultation generally indicates the presence or absence of pulmonary disease; and as we have already seen that latent pulmonary affections may be going on without any external signs — cough or alteration in the respiration — frequent examinations of the chest by the stethoscope should be made.

In detailing the symptoms and explaining the causes of fever, we have seen the prominent importance of the nervous system: its condition, therefore, must in every instance materially influence the prognosis. If the headach, or giddiness, which almost invariably accompanies the disease, continue moderate, or when in its progress they have become severe, but have yielded to appropriate measures — when moderate delirium does not come on till towards the middle of the second week of the disease, and appears chiefly towards the evening — when the patient enjoys intervals of refreshing sleep—or, if the sleep be protracted, he be easily roused from his slumber — if with these symptoms the state of the eyes and expression of the countenance be natural — or should moderate deafness without pain in the region of the ear supervene, a favourable result may be anticipated.

In no disease does the appearance of the tongue afford more satisfactory information than in fever. If, after it has been covered with thick moist fur, it appear cleaner at the edges, or after having been dry and parched, it become clean and moist round the margin, it is a favourable circumstance—more particularly if this change be accompanied with desire for food and abatement of the thirst, heat of skin, and other symptoms.

Another favourable symptom is the appearance of a warm general perspiration: it must, however, be distinguished from a cold, clammy, or partial sweat, or from that occasioned by external heat.

A moderate spontaneous diarrhœa is often a salutary crisis of fever, and if it do not prove exhausting, should not be interfered with.

The prognosis may in some measure be formed from the posture of the patient. When an individual labouring under fever is able to change his position, and to retain it for any length of time, it is a favourable circumstance, showing that a degree of muscular vigour still remains, and that the powers are not unduly exhausted.

The state of the blood, should there arise necessity for venesection, affords an important indication: if it flow readily when the vein is opened, and if on cooling the coagulum be firm and abundant, it is favourable, showing that the system is in a vigorous state.

The unfavourable symptoms of fever may be classed under two conditions — those of undue or excessive excitement, and those of failure of the vital powers.

Under the first may be classed those symptoms which characterize great febrile excitement, more particularly violent action of the heart and arteries, pungent heat of skin, hurried breathing, headach, excessive thirst, and general functional disturbance. These symptoms are more particularly observed in the fevers of warm climates, in which all acute disorders run a rapid course, and are often very fatal. In such cases the excitement may be general, without any marked disturbance in any organ; and although this general excitement has been known in some instances to prove fatal without inducing any inflammatory complication, more commonly some organ becomes, sooner or later, inflamed, and according to the extent of the lesion produced, the danger of the patient is to be estimated.

When symptoms denoting inflammation of the brain come on, viz. acute pain in the head, delirium, suffusion of the eyes, throbbing of the carotid and temporal arteries, rolling of the head from side to side on the pillow, drowsiness or coma, the prognosis is unfavourable, especially if such symptoms occur in an enfeebled constitution, which forbids the adoption of such active measures as are necessary to subdue the local disease.

Again, if inflammation of the lungs or pleura, or of any of the abdominal organs, supervene, the particular lesion being recognised by particular symptoms, the prognosis is unfavourable, unless the local affection be speedily arrested. The safety of the individual in all such cases depends on the promptitude and judgment with which the treatment is pursued, and on the powers of the patient being adequate to contend with the disease and the treatment it requires.

The prognosis, however, is not to be deduced from general symptoms alone, but in connection with the condition of the vital functions. Hence an unfavourable prognosis may be drawn from the following circumstances.

Extreme frequency and feebleness of the pulsations, exceeding 120 in the minute, indicate danger; when they exceed 130, the case may be considered nearly hopeless. Intermission or irregularity of the pulse is also a bad symptom. This state of the pulse no doubt depends on spasmodic action of the muscular structure of the heart arising from the same causes which induce muscular tremor and subsultus tendinum, as we have observed irregularity or intermission of the pulse accompany the general muscular affection, and subside at the same time under a cordial plan of treatment and opiates. On the other hand, it may happen that fever has supervened on some organic disease of the heart which has given rise to the irregular action: these cases can only be ascertained by stethoscopic examination and the previous history.

The condition of the brain in fever affords many indications both favourable and unfavourable. We have already adverted to those symptoms which may be regarded as favourable. Of those which are dangerous, we may mention early delirium, which, although by no means a fatal, is always an unfavourable symptom. Coma indicates great danger. Muscular tremor of the hands, tremulous motion of, or inability to thrust out, the tongue, starting of the tendons, spasm of the diaphragm indicated by hiccup. great failure of muscular power, so that the patient cannot sustain his position on either side, but lies on his back sunk in the bed; involuntary evacuation of the urine and stools; or the opposite condition — retention of urine and difficulty of swallowing, indicate much danger.

Though the low or typhoid fevers are generally accompanied with symptoms of impaired energy in the brain, it should be kept in mind that subacute cerebral inflammation sometimes supervenes under circumstances of great general debility. Such a combination generally proves embarrassing, the practitioner having to contend with inflammatory symptoms, while the general powers are enfeebled and exhausted, or, as Dr. Bateman remarks, "the nature of the one affection absolutely contra-indicating the treatment, which the nature of the other as decidedly requires." When convulsions occur (which they do rarely) they always indicate speedy dissolution.

Loss of sight, although it seldom occurs, is invariably a fatal symptom. Partial paralysis of the retina, indicated by the appearance of black spots, called muscæ volitantes, floating before the eyes, picking at the bed-clothes—or endeavouring to catch or drive away imaginary objects—closure of the upper eyelid, which arises from debility of the levator palpebræ superioris; or the patient going to sleep with the eyelids half closed, may be regarded as alarming if not fatal signs.

Dropping of the lower jaw, so that the patient lies with his mouth open, the jaw-bone falling down from its own weight, in consequence of paralysis of the temporal and masseter muscles—grinding the teeth, which is produced by spasmodic affection of the muscles of the lower jaw, denote great danger.

Another set of unfavourable symptoms which may be referred to the disorder in the brain are, great restlessness, tossing the arms about, and uncovering the body, though the skin be cool.

Any remarkable deviation from the natural state of the respiration or voice in fever is always to be considered unfavourable. The alteration in the tone or strength of the voice, not depending on the dry state of the mouth, throat, teeth, and lips, which prevents the free use of the organs of speech, arises from loss of power in the muscles of the larynx. When the breathing is hurried without any corresponding disease in the respiratory organs, it is a bad omen, showing that there is great debility. When there is intense pulmonary inflammation, either bronchitis, pneumonia, or pleurisy, there is considerable danger. That form of pulmonary disease to which the French writers have given the term *latent bronchitis* is always a dangerous and often fatal complication. It is not indicated by any pathognomonic symptom, and is only detected by auscultation; and when it occupies both lungs, it speedily destroys the patient. The obscurity of pulmonary disease in fever is often owing to the condition of the brain, and hence the indispensable necessity of the frequent application of the stethoscope in the progress of fever.

The symptoms in the alimentary canal which give an unfavourable aspect, are fiery redness of the tongue, its middle or root, as well as the teeth being covered with dry, black sordes; or a preternaturally clean, red, dry, or fissured tongue — tympanitic distension of the belly, with or without pain on pressure — exhausting diarrhœa, the evacuations, consisting of light yellow, serous fluid, being passed unconsciously — hemorrhage from the bowels or bladder. These symptoms are always of themselves exceedingly unfavourable, as they indicate severe lesion of the mucous membrane of the intestines, and when accompanied with sympathetic sensorial disturbance, the issue of the case is seldom doubtful.

Another very alarming and always fatal symptom is sudden acute pain in the abdomen, followed by vomiting, rapid distension, collapse of the features, and extremely small, quick pulse. The pain at first is confined to a limited space, but it soon becomes diffused over the abdomen. These symptoms indicate intestinal perforation, which, it is unnecessary to add, is always a fatal event.

There are certain external symptoms in fever which assist the physician in determining the probable issue.

The expression of the countenance always affords an indication of much value; so much so that those who are familiar with the disease can often pronounce with great accuracy as to the condition of the patient from attentive observation of the countenance alone. It is difficult, if not impossible, to describe the various changes in the countenance in fever: they are known only to those who have had much experience in this disease; and a knowledge of them can only be acquired at the bed-side. In mild cases, there is little alteration from its natural aspect, and should any circumstances arise in the progress of fever sufficient to produce change in its expression, a sure indication of amendment is improvement in the expression of the countenance.

In almost every instance patients become thin under fever; and unless the emaciation be excessive, it is a more favourable symptom than when there is comparatively little wasting of the flesh. When the patient emaciates rapidly, so that he becomes almost a living skeleton, it is generally owing to lesion of some internal organ, very often of ulceration in the bowels. In these cases the prognosis is unfavourable.

We have already alluded to the fetor of the body in some forms of fever. This sometimes arises from inattention to cleanliness when the patient passes his evacuations unconsciously, but more commonly from a vitiated state of the secretions, and consequently of the perspiration. It is always a bad symptom.

Exudation of blood from the vessels of the skin giving rise to petechiæ, or vibices, is an unfavourable symptom, showing great general debility and relaxation of the capillaries, the blood being at the same time deficient in fibrin. Huxham observes, (On Fever, chap. viii.) "that when black, livid, dun, or greenish spots appear, no one doubts their malignity; the more florid, however, the spots are, the less is to be feared: it is a good sign when the black or violet petechiæ become of a brighter colour. The large black or livid spots are almost always attended with profuse hemorrhages. The small dusky brown spots, like freckles, are not much less dangerous than the livid and black, though fluxes of blood do but seldom accompany them. The vibices, or large livid or dark greenish marks, seldom appear till very near the fatal period."

When parts which are subjected to pressure show a tendency to gangrene, it is an unfavourable sign: in some cases large sloughs form on the sacrum or hips, and produce so much constitutional irritation as ultimately to destroy life. Coldness of the extremities, denoting failure in the nervous energy, though often observed two or three days before the patient dies, indicates the near approach of death. The same indication may be taken from cold sweats, which are often referrible to failure of the circulation and relaxation of the capillaries. When the extremities become cold, the surface bedewed with a cold, clammy sweat, the countenance collapsed, the respiration short, interrupted, or laborious, the fatal issue is not far distant.

Causes of Continued Fever.—It has been well remarked by Dr. John Hunter, in his work on the Diseases of the Army in Jamaica, that the great improvements to be made are not so much in the cure as in the prevention of diseases, which depends altogether upon the knowledge of their causes.

The causes of fever have been usually considered under two divisions. The first comprehends those circumstances which predispose to, or render the body susceptible of the operation of the causes which produce the disease: they are termed *predisposing*. The second includes such causes as immediately excite the fever, and are consequently called *exciting*.

1. *Predisposing Causes.*—From this distinction it may appear that a certain predisposition is necessary before the exciting causes can produce their effect; or, in other words, that a predisposition must exist, or be engendered before symptoms of fever can be established. Although a certain condition of the system renders the operation of the exciting causes more efficient, and in some cases contributes essentially to bring on the disease, the exciting causes frequently operate, without the intervention of the predisposing. It has not unfrequently happened that individuals in perfect health, on being exposed to infection, have almost immediately been seized with fever.

A woman admitted into the fever-wards of the Whitworth Hospital stated that on a certain day (Wednesday) preceding the day of her admission, a person not yet recovered from fever came into the house where she then was, and sat down close beside her. She became immediately sensible of a heavy, disgusting odour arising from the person of this individual; was instantly affected with headach, and became very weak; and on the same evening, long-continued rigors, followed by heat and perspiration, came on. She afterwards passed through a severe form of fever.

A clergyman, having enjoyed during the morning his usual health, and having performed the customary church-service of the day, visited, before dinner, a small parochial fever hospital. While speaking to a woman recovered from fever, he discovered that he was standing on a straw just removed from the bed of a fever-patient, in which there was much feculent matter. The odour from thence struck him with force; he immediately felt pain in his head, sickness, and prostration. The same evening he shivered, and fever of unusual severity ensued. Though little hopes were at one time entertained of him, he ultimately recovered. (Marsh on the Origin of Fever, Dubl. Hosp. Rep. vol. iv.)

A child, on being discharged from a fever hospital, was admitted into a charitable institution, and brought with her a small bundle of clothes which had not been disinfected. The bundle was opened by a woman resident in the institution, who perceived an extraordinary disagreeable odour to issue from it. In a few minutes the woman became ill, felt sick at her stomach, and afterwards passed through fever. (Barker and Cheyne's Reports, vol. i. p. 472.)

Nurses, too, have become so powerfully affected on removing the evacuations of a fever-patient, or from applying dressings to gangrenous sores, as to sicken with fever almost immediately after. Instances of this kind are familiar to the writer, and have no doubt been often remarked by other physicians.

It has been confirmed by experience, however, that when the system is in full health and vigour—when all its functions are duly performed and nicely balanced, it is enabled to resist any powerful morbid impression. As soon as this equilibrium is disturbed—when the powers are enfeebled from any cause which tends to break up the strength, or to destroy that harmony of relation which constitutes health, the same causes which were formerly innocuous, become powerful agents in the production of disease. It is on this principle that attendants on fever patients are enabled to resist infection so long as they continue in full health. Hence an important practical principle is deduced, that those who are engaged in attendance on fever should not approach the sick while any symptoms of even slight indisposition are felt.

In all the instances of medical practitioners who have become the subjects of fever, which have come under our notice, there have been almost uniformly, for some time previous to the origin of the disease, evident signs of disordered health. It very generally happens that when precursory symptoms of fever appear, the struggle made against its insidious approach too often renders the subsequent progress formidable, while under early judicious management the primary symptoms might have soon subsided.

It may be useful to point out a few of the more striking and important circumstances which render the system susceptible of the influence of the exciting causes of fever. The first to be noticed is the particular period of life at which fever most frequently occurs. That some idea may be formed of the comparative frequency of fever at different ages, the following table has been constructed from the register of patients admitted into the London Fever Hospital during one year.

Under 10 years	18
Between 10 and 15	68
15 and 20	130
20 and 25	178
25 and 30	100
30 and 35	44
Between 35 and 40	44
40 and 45	31
45 and 50	14
50 and 55	10
55 and 60	8
60 and 65	8
65 and 70	2
70 and 75	3
75 and 80	1
Ages not ascertained	17
324 males 352 females } Total ...	676

From this abstract it appears that fever is most common between the ages of twenty and twenty-five, and next between fifteen and twenty. It decreases in frequency from the age of puberty downwards; and as a general rule it may be affirmed that children, and particularly infants, are peculiarly exempt from the exciting causes of idiopathic fever—the febrile ailments to which they are subject being almost invariably symptomatic of some local disturbance, such as dentition and disorder of the bowels. The frequency of fever between the ages of fifteen and thirty may be explained by the development which takes place, and the tendency to plethora in young persons. It may also be stated that the type of fever is apparently influenced by the particular period of life—inflammatory or acute fevers being more common from puberty to the age of forty. It is also modified by individual temperament, persons of the sanguine being most liable to the acute, those of the melancholic to the low forms of the disease.

We have already noticed how much a vigorous state of health contributes to protect the system against the influence of the exciting causes of fever: it consequently follows that whatever tends to impair the health becomes indirectly a predisposing cause. Those circumstances which induce plethora on the one hand, or inanition on the other, may therefore be regarded both as predisposing and exciting causes, according to the duration of their application and the condition of the system at the time they are applied. Of the two, however, scarcity or famine is the most powerful: indeed, in all ages famine and disease have been observed to be coexistent. Hence, it may be considered as an axiom, that scarcity of food, as well as food of a bad quality or improper kind, powerfully predisposes the system to the influence of the exciting causes of fever.

In tracing the records of epidemics, it will be found that they have almost invariably been preceded or accompanied by distress among the lower orders, either from the high price of provisions, or from some commercial causes, throwing the manufacturing portion of the community out of employment. In the epidemic fever which has at various times visited Ireland, all the medical practitioners allude to the inadequate supply of food among the inhabitants of the towns or districts where it raged. Insufficient and unwholesome nutriment, by impoverishing the blood, not only brings on emaciation, but depresses the nervous energy; hence, the system, under such circumstances, is readily acted on by the exciting causes of fever. In times of pestilence, therefore, due attention should be paid to the quality as well as quantity of the food, avoiding on the one hand too scanty an allowance, while on the other, the stomach should not be overloaded, especially with stimulating food. We consider a moderate but liberal allowance of animal food to be a good preservative against the exciting causes of fever. This observation is strengthened by the fact, that during the plague which raged in London in the seventeenth century, the butchers of the metropolis were observed to be remarkably exempt from the disease, and in our own experience butchers are rarely the subjects of fever.

The moderate use of wine, by strengthening the body, obviates a predisposition to fever, and therefore, during the prevalence of epidemic fever, has been recommended. It should, howevor, be strongly impressed on the mind, that the immoderate use of wine or intoxicating liquors, under such circumstances, actually renders the body more susceptible of the exciting causes. Dr. Chisholm remarks that those who were addicted to intemperance, were most subject to the fever of Grenada; and as every kind of ardent spirits operates as a slow but sure poison, producing great debility, and sapping the powers of the system, it is the duty of every one to discourage their use in the time of epidemic visitations.

Bodily fatigue may be mentioned among the causes which tend to impair the natural vigour of the body, and thus render the system more susceptible of the exciting causes of fever. This may be either excessive and of short duration, as in violent exertion, or it may be prolonged, as in long journeys. It is well known to army surgeons, that soldiers very readily fall into fever, when exposed to its causes after a long march or severe and continued exertion in the field; and, in times of scarcity and privation, the journeys which whole families are not unfrequently compelled to take in quest of employment and support, render them more liable to be attacked with fever than they otherwise would be.

Another set of predisposing causes are those which give a severe shock to the nervous system. The various kinds of mental emotion—fear, grief, anxiety, disappointments, long-continued watching on a sick bed, intense study, want of sleep, may individually be ranked among the predisposing causes of fever. As Dr. W. Philip observes, therefore, few things are better preservatives against infection than fortitude and equanimity. Nothing, we are informed by those who voluntarily exposed themselves to the contagion of the most pestilential fevers, was found so great a preservative against its effects, as a steady adherence to what they believed their duty, banishing from their minds, as much as possible, all thoughts of danger, and avoiding every kind of passion, particularly the depressing passions. Every body knows how much fear predisposes to infection: on this account it is of consequence to strengthen the faith of the ignorant in the efficacy of any thing they believe capable of preserving against infection. (On Febrile Diseases.)

2. *Exciting Causes.*—The *exciting* causes of fever form a most important and interesting subject of investigation, though it must be acknowledged that notwithstanding all that has been done in this department of etiology, the subject is still involved in obscurity.

There can be little doubt that the opinion entertained by many, of the exclusive origin of all forms of continued fever in contagion, has tended much to limit our knowledge of its other causes. That fever does occasionally originate in contagion few persons of experience or unbiassed judgment will now deny; but there are other causes which operate with equal certainty, a knowledge of which it is exceedingly important to attain.

The records of medicine contain abundant proofs of the origin of fever in the poison generated by the decomposition of vegetable and animal matters, though it seems probable from some facts, that the exhalation from vegetable substances in a state of putrefaction is more injurious than that from animal; and from the circumstance of the prevalence of fever in some particular places, and the number of persons who have become affected from residence, even for a short time, in those situations where it has been found to prevail, it has been concluded that fever may arise from a terrestrial or atmospheric poison generated in such localities. To the febrile poison, however produced, the term miasm, (from the Greek word importing pollution, corruption, or defilement generally,) or malaria, (from the Italian term implying bad or impure air,) has been applied. It is well ascertained that vegetable as well as animal substances, in a state of decomposition, emit effluvia or exhalations which prove extremely hurtful to the human body, and when applied in a state of sufficient concentration are productive of most severe illness, or even of instantaneous death. On this account, all febrile poisons have been supposed to originate in one or the other of these sources, or in a peculiar unknown pestilential condition of the atmosphere, to which, from the number of persons simultaneously affected, the term *epidemic* has been given.

We know very little about the physical qualities of these emanations or vapours beyond their noxious effects on the animal body: they are invisible and without taste or smell: chemistry has failed to unfold their nature, as on submitting them to the test of chemical analysis, nothing beyond the fact that they contain a considerable proportion of hydrogen and carbonic acid gas has been discovered. Hence some ingenious persons have endeavoured to deduce the unhealthiness of low damp situations in the warm season, to a supposed deficiency of oxygen in the atmosphere, though, as Dr. Bancroft has very justly stated, were we to assume this principle, fever should be produced by every crowded assembly, and in a multitude of situations where no such effects have been observed.

It would appear from fever arising in particular localities, that noxious exhalations are generated from some soils only, and that the combination of heat and moisture is also necessary for their production. We find, accordingly, that in the same district, one place or spot is unhealthy, while at a very short distance, perhaps, the inhabitants are remarkably free from disease; and that, in some seasons which have been remarkably dry, even when the heat has been unusually great, fever is either little prevalent, or entirely unknown.

Though every soil contains an admixture of animal matters in a state of decomposition, it is probable that the deleterious principle which gives rise to fever is derived from vegetable substances almost exclusively. This opinion is strengthened, if not confirmed, by what is observed to take place during the process of preparing hemp, flax, and indigo for the various purposes for which they are used in commerce.

These plants in their preparation are steeped in water, and during their decomposition extremely offensive emanations arise. Lancisi gives the history of an epidemic fever, which for several summers infested and almost depopulated a town situated in an elevated and salubrious part of Etruria. This fever arose from the emanations from ponds or stagnant waters in the lower part of the town in which hemp and flax were macerated: on the process being afterwards prohibited, there was no recurrence of fever. Dr. Bancroft states he was informed at Naples that in several places near that city, and particularly in some beyond the Grotto of Posilippo, sleeping in houses contiguous to ditches in which hemp or flax was macerating had been almost constantly followed by fever. Similar effects have been observed from the fermentation which the indigo plant undergoes in the process for extracting the colouring matter. It appears that, after the extraction of the dye, large heaps of the plant are formed near the manufactories and houses of the work-people, for the purpose of undergoing decomposition so as to form manure. After being frequently moistened by the heavy rains, and heated by the rays of a scorching sun, copious exhalation takes place from these beds of putrefying vegetable matters, in consequence of which the workmen, and persons who live near, were constantly attacked with dangerous fevers. This circumstance having of late years attracted the attention of the indigo planters, the plant, after the extraction of the dye, is not permitted to be formed into heaps near the works or dwellings of the labourers. Fevers are consequently now comparatively rare among the workmen. (Bancroft on Yellow Fever.)

From these facts it would appear that there are some deleterious emanations emitted during the putrefactive process of vegetable matters. [It will be seen, however, under the article Malaria, that none of these processes produce disease except in soils which are known to be malarious. In some recent sanitary reports (*Local Reports on the sanitary condition of the labouring population of England, in consequence of an inquiry directed to be made by the poor law commissioners:* Lond. 1842,) great stress is laid by most of the medical reporters upon the influence of the effluvia from animal and vegetable remains in stagnant pools, &c., in the production of the typhus. Yet it may admit of question, whether the typhus was fairly referred to such miasmata.] Some have endeavoured to show, however, that moisture alone, applied to the living body, produces fever. This position has been again and again disproved by the most conclusive facts; indeed, the argument adduced by Dr. Bancroft, of the remarkable healthiness of the men employed in the Newfoundland fisheries, where they are generally enveloped in the dampest fogs for several months together, affords the least ambigous proof, that the atmosphere when loaded with moisture only, has no greater power in causing fever, than it has when in any usual state of dryness.

It would appear that a combination of circumstances, more particularly heat and moisture, is necessary to give potency to putrid emanations.

Miasmata generate very slowly in a perfectly dry situation; and it has been generally remarked that fevers are not prevalent in dry seasons. Dr. Bancroft states that it is found on the west coast of Africa, and in some of the West India islands which are liable to long droughts, as Barbadoes, and more particularly Antigua, that marsh fevers occur very seldom in dry seasons; but that they become very prevalent whenever these droughts are suddenly terminated by frequent rains.

Dr. James Clark, in his Treatise on the Yellow Fever, observes that when there was much rain in the months of May and June, and dry sultry weather prevailed in the following months of July and August, fever raged much among the troops and strangers. This is precisely what is observed to take place in the fevers of temperate countries.

The effect of heat in promoting putrefaction, and the consequent generation of emanations, is evident from the variation observed in the putrefactive process in different temperatures. A very low or a very high temperature is unfavourable to the decomposition of dead inorganic matter, putrefaction being entirely suspended at the freezing point, and proceeding very slowly at any degree under 45° of Fahrenheit: it gradually increases from this point, and appears to take place most readily about 100°, but to be checked when the temperature exceeds 100°. It has been remarked that in districts, where marsh fevers are prevalent, their progress is arrested, and in many cases they entirely disappear during a continued frost: when spring advances they reappear in a mild form; in summer they prevail more extensively; and in autumn the cases not only increase in number, but assume a more severe form. Precisely the same thing happens with regard to the continued fevers of temperate countries, so that the combination of heat with moisture must be admitted to be a powerful circumstance in the production of fever.

It is necessary, however, to state that paludal emanations are generated in greater quantity, and probably in a state of greater concentration, when there is only such a degree of moisture as facilitates putrefaction.

It is well known that in marshy districts fevers do not appear in the rainy season till the water has nearly evaporated or drained off; and, as Dr. Bancroft states, attention to this important fact will enable us to understand, why in some countries frequent and heavy rains render marsh fevers prevalent, while in others the deprivation of rain for two or three months produces equally morbid effects.

The fact that in very dry seasons fevers are seldom observed has been already noticed; in very low situations where the ground is much moistened and often inundated in the rainy seasons, the inhabitants remain free from fever till the water evaporates from the heat of the weather, so as to leave the ground in many places uncovered. The comparative insalubrity of situations in the vicinity of stagnant waters compared with running streams is thus explained.

In the third volume of the Journal de Physiologie, an interesting account is given of a fever which occurred in the autumn of 1822; its origin was ascribed to exposure to the emanations of stagnant waters, and using the same water in food. The symptoms of the fever were pain in the epigastrium, purging, distension of the belly, feeble pulse, thirst, black furred tongue, fetid sweats, and great prostration. The convalescence was remarkably tedious. Hence the expediency of occasionally inundating a marsh in hot weather, when any deleterious exhalation arises.

There is considerable difference in the various kinds of soil as regards the generation of emanations. Fevers have been generally remarked to be more common when clay constitutes a considerable proportion of the soil. Whether this is owing to the greater humidity of a clayey soil, or whether it favour the putrefactive process more than other kinds, is yet a matter of conjecture.

We may here allude to the singular exemption of persons who live near peat-bogs or moors from marsh fevers; this has been observed to be remarkably the case in some districts of Scotland and Ireland. The cause of this apparent salubrity in the districts referred to has not been satisfactorily explained, but it is well known that peat-bogs have the remarkable property of preserving both dead animal and vegetable matter from putrefaction. According to Dr. Bancroft, not only plants and trees, but even human bodies with their clothing, when completely immured in the peat soil, will scarcely undergo any change during a long course of years; and it is probably owing to this peculiar property that they do not exhale, and perhaps do not generate, miasmata similar to those which arise from marshes. Some chemists who have made experiments with a view to discover the nature of peat, are of opinion that its antiseptic powers are derived from *tannin*, though from a certain quantity of iron being always found in peat, it is probable that this metal may have a considerable share in contributing towards its antiseptic properties.

From what has been stated, it is evident that *not only* the origin but the propagation of fever depends on a great variety of circumstances, which, in tracing the causes of the disease in any particular locality, should be minutely investigated.

It is often found that fever is confined to a limited district, so that one part of a town is sickly while other districts are healthy. This has been repeatedly remarked in the malarian fever which prevails in the summer and autumn at Rome, the disease appearing chiefly in the low parts of the city near the river, while the other districts are quite free, unless when the wind blows in the direction of the Pontine Marshes. Particular streets have been observed to be more unhealthy than others; and it has been said that fever has run through every house on one side of the street, while the inhabitants of the opposite side escaped.

Ample proofs of the injurious effects of emanations from vegetable substances in a state of putrefaction on the living body having been adduced, let us next examine into those arising from the decomposition of animal matter. It would appear, however, from the immunity of persons exposed to the effluvia of dead animal matter, that its application to the living system is rarely followed by any injurious consequence. Persons who are much exposed to animal putrefaction, such as the men who are employed in particular trades, skinners, parchment-makers, catgut and glue-makers, nightmen, and students of anatomy, who are engaged for several hours daily in prosecuting their anatomical studies, are seldom known to suffer from their occupation. The same immunity is not enjoyed by persons who are long enough exposed to the effluvia from putrid vegetable substances. It is true that persons who have been engaged in the removal of corpses from burying-grounds, and nightmen, have suffered from their occupation; but the disease occasionally induced in them does not appear to have any resemblance to fever.

Fourcroy states that in some of the burial-grounds of France, when the grave-diggers in opening the ground penetrate graves in which bodies have been recently placed, they become affected with vertigo, sickness, tremors, and a feeling of oppression; in some instances they become asphyxiated: it has also been observed that numbers of those who live in the vicinity of cemeteries labour under dejected spirits, sallow countenances, and febrile emaciation.

The human body, not only when affected with disease, but under certain circumstances in a state of health, generates a poison which gives rise to fever. This principle, notwithstanding the reasoning of ingenious disputants, has been incontrovertibly established by a multiplicity of facts.

There can be no doubt that the most potent febrile poisons are the exhalations from the bodies of persons labouring under some form of fever. The proofs on this point are so clear and satisfactory, that few persons deny that fever originates in contagion. To assert that contagion is the only principle capable of producing the disease evinces a very limited notion of the circumstances under which fever is generated; and yet this opinion was taught by Cullen, and is implicitly believed by many even in the present day. It is almost as absurd as the idea still entertained that fever cannot be propagated by contagion. Sir John Pringle states that he has observed the hospitals of an army, not only when crowded with sick, but at any time when the air is confined, and especially in hot weather, produce fever of a peculiar kind which is often mortal. The same thing has been observed in almost every hospital, and shows that the congregation of sick persons does, under some circumstances, produce fever.

It is not necessary however that such exhalations, in order to generate fever, should arise from the bodies of persons in a state of disease: it is well known that fever is readily produced by the accumulated emanations of healthy persons. Sir John Pringle mentions that he had observed fever arise in full and crowded barracks, and in transport-ships when filled beyond a due number, and detained by contrary winds, or when the men had been long kept at sea under close hatches in stormy weather.

We have frequently observed that the febrile poison becomes so virulent in a confined atmosphere, that every person who has been exposed to its influence has been attacked with fever; and as if to show the agency of a specific poison, the symptoms in every individual who has received the infection have been remarkably similar.

It is this concentration of human effluvia which is so productive of fever in crowded ships, prisons, and workhouses, more particularly in warm weather, and when little attention is paid to ventilation; for it should be remembered that the febrile poison may be so diluted by pure air as to be rendered almost innoxious. Few parish workhouses, when overcrowded with paupers, especially in the summer months, escape the visitation of fever; and when an epidemic appears in a large town or manufacturing district, the ravages which it commits in the crowded, ill-ventilated dwellings of the poor are often appalling.

The facts which have been accumulated from the most authentic sources prove that fever may be communicated from person to person by contagion. It does not require actual contact to produce the disease; exposure to the atmosphere of the apartment, but more especially to the exhalation from the body of a fever patient, being sufficient. In the article CONTAGION, (to which we refer for more ample details,) such abundant illustrations have been brought forward, that the most sceptical must be convinced of the origin of fever in this source. We certainly think that Dr. Marsh, in his paper on the origin of fever, (Dublin Hospital Reports,) has brought forward a body of evidence which should alone decide the question. The facts there collected are corroborated by the experience of every fever hospital as to the medical officers, nurses, and immediate attendants on the sick, and every inmate of the establishment, of whatever description, being with few exceptions affected with fever. We have known many instances of nurses pointing out the very patient from whom they received the infection; others have been sensible of a sudden and particular impression at the moment the poison was received. This impression has been sometimes from the fetor of the body, not unfrequently from the stools, or in removing the linen of the patient.

[The writer has elsewhere (*Practice of Medicine*, edit. cit. ii. 488) referred to many analogous cases, some of which were observed by Drs. Gerhard and Pennock at the Philadelphia Hospital. It would not seem that the dead body of a typhous subject is apt to communicate the disease. In an epidemic of unquestionably contagious fever, which occurred at St. Bartholomew's Hospital, London, and which has been described by Dr. Roupell, (*A Short Treatise on Typhus Fever*, Amer. Med. Lib. Edit. p. 31, Philad. 1840,) seventeen bodies of those who had died of the fever were submitted to dissection. On an average, eight pupils were engaged on each; so that one hundred and thirty-six were thus occupied. Six of the whole body of students were attacked with fever; but of these six, two only devoted their time to dissection; and these two had been exposed to the infection of the living body in the wards of the hospital. In the epidemic at the Philadelphia Hospital, both Dr. Gerhard and Dr. Pennock, with several of the resident physicians, were engaged nearly every day during the most intense prevalence of the disease, in making long and laborious anatomical investigations, without suffering from the fever. (*Amer. Journ. of the Med. Sciences*, Feb. 1837, p. 299.)

If it be granted that typhus is capable of being communicated from individual to individual, it is clear that the poison cannot be very virulent, and that if due attention be paid to cleanliness and ventilation, and to avoiding prolonged exposure in the immediate vicinity of the patient, it may be rendered almost harmless, except in the case of unusually susceptible persons. Dr. Christison (Tweedie's *Library of Pract. Medicine*, 2d Amer. edit. i. 169, Philad. 1842) remarks, that among numerous instances known to him of young practitioners and medical students who had caught fever, not a single case had occurred where the disease was communicated to their families at home, or in their lodging-houses; and the experience of the writer has been the same.]

Persons in a state of full health and vigour are much less likely to become affected with fever, than those whose powers are exhausted. It is on this principle that the nurses and attendants in fever hospitals resist for a time the febrile poison; but after a longer or shorter exposure, more especially if the strength has been impaired by bodily fatigue, want of sleep, and close confinement to the sick room, they almost invariably lapse into fever—a convincing proof that whatever weakens the general strength tends to render the operation of the exciting causes of fever more certain and effectual.

Any undue mental fatigue also powerfully aids the operation of the exciting causes of fever; and we have often verified the remark of Dr. Marsh, that in such cases the violence of the disease falls on the brain and nervous system, producing what is emphatically termed *brain fever*.

In the same manner we may explain satisfactorily the rapidity with which contagion spreads in times of scarcity or famine. The poor under such lamentable visitations are generally exposed to circumstances, which render them readily affected by causes which under more favourable events would be inoperative. Fatigue, exposure to cold and wet, insufficient or improper kind of food, are the too general attendants of epidemic fever among the poor.

Though mental emotion of a depressing kind powerfully predisposes the system to fever, it is singular how much an unusual degree of excitement acts apparently as a preventive. It is not unusual to observe that, during the painful anxiety and suspense, between hopes and fears as to the recovery of a valued relative and friend, the body is as it were armed against the effects of contagion. When this state of excitement is withdrawn, it is frequently followed by the same disease which was the cause of such intense anxiety, as if, in short, the system became relaxed so as to receive the influence of the infection to which it had been exposed.

From what has been stated, it is evident that when there is any indisposition, exposure to contagious fever should be avoided.

The means of guarding against contagion must at once suggest themselves. These consist in ventilation, separating the healthy from the sick, avoiding the effluvia from the skin, from the breath, and more especially from the evacuations; in adopting a nutritious but not stimulating diet; and in preserving moral courage,—fear, as we have stated, always predisposing the system to infection, so much so, that during the prevalence of an epidemic disease the terror it induces tends materially to increase the number of its victims.

The following brief sketch of fever originating in long-continued mental anxiety, by Dr. Cheyne, vividly describes a not infrequent and somewhat peculiar form. "The *causes* are loss of property, of character; wounded pride. *Invasion* insidious, indistinct, patient generally unable to assign the date of the commencement of the attack; for some time before he has been complaining of bad nights, or has had symptoms of a common cold, which almost insensibly degenerate into the proper symptoms of fever; then, from an ignorance of the nature of his illness, he neglects himself, perhaps for many days; and at last when visited by a physician, he appears utterly unconscious of the formidable nature of his disease, and probably says he has no complaint—he is merely very weak: the symptoms are those of the typhus gravior of nosologists; a red suffusion of the eye; prostration of strength; subsultus tendinum; quick and weak pulse; hurried breathing; dun petechiæ, or a mottled or morbillary state of the surface. Of such patients a great proportion die. The most remarkable part of the disease is that it does not spread." Dr. Cheyne has no recollection of a second case of this kind of fever occurring in a family, and he has never been able to discover that the patient had been exposed to contagion. It would seem to arise solely from mental causes. (Marsh on the Origin of Fevers, Dub. Hosp. Rep.)

Few circumstances connected with the causes of fever have attracted more attention than its tendency to become epidemic, and to prove malignant and fatal at particular times, while at others the disease is little prevalent and of a mild character. These variations in febrile diseases have existed in all ages; they were particularly remarked by Hippocrates, who ascribed them to something divine, in which idea he was followed by Galen. In more modern times, these differences have been ascribed to the influence of some atmospheric or terrestrial agency, of which little or nothing is known except the effects it produces in the propagation and malignity of diseases. The notion that such pestiferous causes depend on planetary influence has been long exploded, though they appear to have an intimate connection with sudden and extreme variations of temperature, more especially excessive heat combined with moisture. It is by no means uncommon to observe the prevalence of fever sensibly checked when the air is dry and cold.

Other contagious diseases as well as fever become epidemic and malignant at particular periods. This has been more especially observed with regard to small-pox, measles, and scarlatina, which, though never extinguished, are more frequent at some periods of the year, as well as more malignant at certain seasons than at others.

It is probable, therefore, that the circumstances which contribute to the prevalence as well as malignity of febrile diseases, operate by increasing the predisposition, or by rendering the body more susceptible of the influence of their various exciting causes. Hence the obvious effect of living in confined places, or of scarcity, or of any causes that undermine the powers of the system, in rendering the exciting causes of fever operative.

Not only is there a great difference in the number of persons affected with fever at particular times, but there is often, also, a remarkable similarity in the symptoms. Thus in the winter and spring months, the fever is of a more acute character, and generally complicated with cerebral or pulmonary inflammation. In the autumn they are of a less active kind, and accompanied with more or less gastric irritation.

It is impossible, in the present state of our knowledge, to account for these various modifications in the character of fever, though it is of the greatest importance to observe them with the view of regulating the treatment.

Climate has an important influence, not only in giving a predisposition to fever, but in modifying its character or type. The inhabitants of warm climates are more liable to fever than those who reside in cold or temperate countries. The symptoms also are generally more violent, and the progress of the disease more rapid, while the type of the fever is very liable to change. The predisposition to fever, however, diminishes by continued exposure to its causes, and hence the immunity frequently observed in the natives of warm climates, while strangers or new comers are almost invariably attacked, soon after their arrival, with the peculiar fever of the country.

We have already alluded to the effect of heat in the production of fever. The negative principle of *cold* has been usually placed among the exciting causes. Though, undoubtedly, cases of mild fever may be traced to exposure to cold, it is more probable that it acts as a predisposing cause, especially when the body is weak, and little able to resist its effects. Dr. Marsh is of opinion that cold, like contagion, is an impression made on the sentient extremities of the nerves; its effects are in like manner instantaneous; its action, though powerful, is resisted when the body is vigorous and strong, but its impression upon those who are exhausted, fatigued, or relaxed, is followed very frequently by consequences formidable and even fatal.

It appears from some facts which have been noticed, that while some individuals are enabled to resist the operation of the exciting causes, others are only indisposed in a peculiar and indefinite manner after exposure to them, as if there were a struggle in the system to obviate their effects.

Fever, moreover, has been apparently induced by exposure to other acute diseases. Dr. Marsh mentions the case of a nurse in Stevens's Hospital, who was suddenly seized with illness while in the act of turning in the bed a boy labouring under confluent small-pox. She remained ill but not incapacitated for business for three days. She then had rigors followed by severe fever, the ordinary typhus of this country. Dr. Johnson asserts that he observed in some instances that the ward-maids of the lying-in hospital caught typhus fever from the patients then affected with puerperal fever.

It would be exceedingly important if the mode in which the various febrile causes produce their effects could be satisfactorily demonstrated. It appears evident, from attentive observation of the general characters of fever, that there is occasionally a very remarkable difference in its forms or types, as well as in the particular symptoms on which its distinctive varieties have been founded.

The local lesions or complications, we have seen, assume remarkable variation in certain seasons and in particular epidemics, both in respect to the organs individually affected, and in the degree or intensity of such local inflammations. These circumstances lead to the belief, either that the febrile poison is different at different times, or that it is so modified by the state of the system as materially to alter its effects. The former is the more probable explanation, though from the nature of the febrile poison, such difference cannot be demonstrated, but is only rendered probable from its effects on the human body.

Though it is impossible to explain the operation of all the exciting causes of fever, there appears to be a very close analogy in the action of many to that of other poisons. We know that this class of agents (poisons) affect different structures: the narcotics, for instance, act on one organ—the nervous system; others have a two-fold action, as in the instance of the acro-narcotics, which evidently operate both on the nervous system and on the mucous membrane of the bowels, giving rise in the former to peculiar symptoms of narcotism, while a more severe effect is produced on the latter—inflammation and its consequences.

It cannot be demonstrated, but it seems more than probable, that some of the febrile poisons, whether originating in animal, vegetable, or atmospheric miasmata, operate on particular structures.

In some cases it would appear that the brain and nervous system are the only organs affected by the febrile poison; at all events, the nervous system appears to be early, if not primarily disturbed, as is evident from the shock which the whole system receives on exposure to some of the causes alluded to.

The symptoms in the brain are not, however, always the effect of the primary action of febrific causes on this organ. The nervous system is so susceptible of distant sympathetic impressions, that there is often great difficulty in distinguishing primary from secondary cerebral disease in fever. When there is intestinal affection more especially, the brain always sympathises; in which case it is often very difficult to determine whether the cerebral disturbances arise from the peculiar operation of the febrile poison on the nervous system, or whether it be only sympathetic of the morbid condition of the alimentary canal.

Again, fever assumes particular forms at different seasons of the year. It is well known that in some epidemics, and at certain seasons, the mucous membrane of the air-passages is affected, the existence of this form of fever being indicated by the catarrhal symptoms which accompany it. There seems every reason to believe, that at those periods when epidemic catarrh or influenza appeared, and of which Sydenham, Huxham, and Baker have given faithful and valuable reports, some peculiar condition of the atmosphere prevailed.

In like manner, in the autumnal months, the symptoms of gastric disorder form the prominent character of the fever. We have seen also that intestinal affections are not only more common at particular times, but occur in a larger proportion of cases in some localities than in others. This evidently arises from some circumstances peculiar to those situations. The effect of terrestrial emanations, rendered virulent by long-continued rains in hot climates, in producing dysentery, has been remarked by many writers and army-physicians.

We shall next consider how far morbid states of the blood are to be regarded as exciting causes of fever.

The ancient writers ascribed with great truth the origin of many diseases to a morbid condition of the blood and humours; and though the cultivation of anatomy has led to the investigation of the solids as the great source of diseases, yet that many arise from a morbid state of the blood, is admitted even by the warmest adherents of solidism.

No one doubts that scurvy depends on vitiation of the blood, in consequence of improper diet, or living in an unwholesome atmosphere, and that in its progress (whatever cause may have produced the alteration in the blood) various local diseases take place; showing, as Andral remarks, "that many lesions, apparently inflammatory, are far from depending simply on a local morbid state, but being connected with certain conditions of sanguification, can be removed only by a return of that process to its natural condition."

Sir John Pringle mentions a remarkable fact which came under his personal observation, of a person being seized with dysentery by making experiments upon human blood, which had become putrid by standing some months in a close phial.

M. Gendrin injected one ounce of blood, drawn from the veins of a patient labouring under putrid fever, into the cellular tissue of the groin of a cat. Copious vomiting, dyspnœa, small, frequent, irregular pulse, dry brown tongue, great prostration, and slight convulsions before death, were the effects which followed this experiment. The animal died within seven hours after the operation.

Duhamel has related the case of a butcher who suffered from a most malignant disease, and which proved fatal in four days, from putting into his mouth the knife he had employed in slaughtering an ox that had been over-driven. An innkeeper wounded himself with a bone of the same ox in the palm of his hand; the arm mortified, and he died in seven days. In two women who had received some drops of blood of the same animal, the one on her hand, the other on her cheek, the parts to which the blood was applied were seized with gangrenous inflammation.

It is well known that specific febrile diseases, small-pox, and even measles, can be produced by inoculation; and that these diseases, as well as the syphilitic poison, may be communicated through the umbilical circulation from the mother to the fetus in utero, while a healthy infant after birth may become affected with syphilis from the dis eased milk of an infected nurse. It has also been asserted, "that in females who have died during pregnancy from the effects of some deleterious poison, the same specific agent which the mothers had used has been found in the blood taken from the heart of their dead infants." (Observations on the Healthy and Diseased Properties of the Blood, by Wm. Stevens, M. D.)

In females who are chlorotic, the blood is altered in its physical characters, and is apparently the cause of this singular disease. It is deficient in the solid or fibrinous principle, and consequently it is thin and pale, and scarcely tinges linen. The symptoms in this affection are so general, that we may safely affirm that every organ and function of the body suffers more or less.

It is not uncommon also for leeches to die immediately after they have sucked the blood of some persons. Cases of this kind have been occasionally recorded. (Christison on Poisons. Medical Gazette, February, 1831.) In these cases the presumption is, that some deleterious agent has been mixed with the blood, which has proved fatal to the leeches.

The following is a singular instance of a vegetable poison entering the circulation, and producing no injurious effect on the animal, but afterwards producing fever, and even death in those who use its milk.

A plant, which is called by the natives the *Indian Hacky*, grows in Tennessee, on the banks of the river Cumberland, and in other parts of the western district of the United States of America, and is so poisonous, that a small quantity of the milk of cows that have fed upon it, mixed with tea, produces most violent fever, and in some cases even death. The following account of the disease produced by this poison is given by Dr. Macall:—"After swallowing the milk, the person in a short time suffers from thirst, nausea, vertigo, confused or imperfect vision; vomiting often ensues, succeeded by violent fever, the exacerbations subsiding at irregular intervals. The pulse is extremely variable, sometimes strong and full, at others, tremulous, small, and corded. Constipation, which exists from the beginning, becomes more obstinate towards the third or fourth day. The skin also about this time is more hot and parched, the eyes are red and suffused, there is very great restlessness, and all the secretions are scanty. Towards the sixth and seventh day excessive debility takes place, with very often paralysis of the tongue and other parts; and soon after ensue stupor, cold clammy sweats, convulsive hiccup, and often offensive cadaverous odour, and death." (Philadelphia Journal, 1822.)

Dr. Haines, in his account of this disease, which the natives call *the trembles*, [*milk-sickness*,] observes, "that the heart beats with such violence in some cases as to excite horror in the physician and bystanders. When they lay the hand upon the patient's breast, it seems to labour convulsively, and as though it were clogged in its action by a superabundance of blood. The patient feels nothing he can strictly call pain; but the sense of heat, the oppression, the palpitation of the heart, and the violent efforts to vomit, constitute an extreme degree of distress."

It is also stated that the milk and flesh of animals killed while labouring under this disease will produce disease in other animals. Sucking calves, which have had no food but the milk of an affected cow, show the peculiar symptoms, and often die of the disease. Persons also making use of the milk or butter from the same cow have become affected.

In an instance of a whole family becoming sick with this disease (some of them in a few hours after dining upon a loin of veal), it was afterwards satisfactorily ascertained that the calf, which was sold in the market by an unprincipled person, laboured under the disease at the time it was butchered. In another instance several persons became severely affected from incautiously eating of a pig, which had been fattened upon the milk of a cow that was known to be affected with the disease: all of the family who ate of it were seized, some of them in a few hours.

These facts lead to the conviction, that many diseases are produced by a morbid state of the blood.

We formerly adverted to the revival of the opinion among modern pathologists, that a certain class of fevers arise from this source. Many writers who have observed the fevers of hot climates (Warren, Hume, Hillary, Stevens, and others), describe the altered state of the blood in the ardent malignant fevers, and from the accounts given by some physicians of the fevers of hot climates, it is more than probable that the diseased state of the blood precedes, and is the cause of the febrile symptoms.

In the Genesee country (the lake country of the United States) there are extensive swamps, so that in the hot months there are certain localities in which fever prevails extensively. Dr. Stevens states that during his residence in that country he bled several individuals who resided in some of the most sickly places, but who had not yet been attacked with the fever. The blood was very dark in colour, and evidently deranged in its properties.

Dr. Potter, with the view of proving the non-contagious nature of the yellow fever, which had been very fatal at Baltimore, observes, "it was remarkable in all cases in which it was deemed expedient to bleed, the blood wore the same general appearances. After a separation had taken place, the serum assumed a yellow shade, often a deep orange, and a portion of the red globules was invariably precipitated. It occurred to me that if the remote cause resided in the common atmosphere, the blood of all who had inhaled it a certain time would exhibit similar phenomena. It accorded with the pathology I had conceived to, conclude, that all who lived in an atmosphere so inquinated were constantly predisposed, and that an additional or exciting cause only would be required to develope the symptoms in form. To ascertain the appearances of the blood in subjects apparently in good health, I drew it from five persons who had lived during the whole season in the most infected parts of the city, and who were, to every external appearance and inward feeling, in perfect health. The appearances of the blood could not be distinguished from that of those who laboured under the most inveterate grades of the disease. As this experiment might have been considered inconclusive, unless the blood could be compared with that of those who lived in a purer atmosphere, remote from the evolution of miasmata, I selected an equal number of persons who dwelt on the hills of Baltimore county, and drew from them ten ounces of blood. The contrast in the appearances was so manifest, that no cause for hesitation remained. There was neither a preternaturally yellow serum nor a red precipitate: the appearances were such as we find in the blood of healthy subjects. A young gentleman having returned from the western part of Pennsylvania, on the 10th of September, I drew a few ounces of blood from a vein on that day; it discovered no deviation from that of other healthy persons. He remained in my family till the 26th of the month, and on that day I repeated the bloodletting. The serum had assumed a deep yellow hue, and a copious precipitate of red globules had fallen to the bottom of the receiving-vessel. Of the six persons whose blood assumed those indications of the remote cause, four were seized with fever during the epidemic; the other two escaped any formal attack, but complained occasionally of headach, nausea, and other indications of disease. Hundreds who were not confined, and who never took medicine, experienced the effects of the general cause, under a variety of forms, such as nausea, giddiness, headach, constipation, a pale or yellow face, tinnitus aurium, pains in the extremities, and some other light shades of incipient indisposition. In some there were premonitory symptoms of a formal attack; in others they vanished, leaving the subject in his usual health. Many were listless, complaining of universal languor, indisposed to muscular exertion, yet did not surrender to the disease. They were neither sufficiently indisposed to be placed on the sick-list, nor well enough to pursue their ordinary occupations."*

With respect to the state of the blood in fevers of temperate countries, Dr. Mead says, "Pestilential fevers, in fine, I call all those which are accompanied with some sort of poison. Now of whatever nature this happens to be, it not only infects and corrupts the blood, but seizes upon the subtle nervous liquor. Hence it is, that these fevers act with greater rapidity and violence, and are much more fatal than the common sorts."

Dr. Stoker conceives typhoid or adynamic fever to be generally symptomatic of morbid changes in the physical character of the blood. He states that the crassamentum is dissolved, or broken into fragments, tinging the serum with its colour, which is sometimes of a very dark brown, and sometimes of a greenish hue. These changes he considers to be intimately connected with disturbance or failure of the vital power in the process of sanguification; and that the morbid changes which take place in the blood become, in proportion to their degree, the source of morbid action. (Report of the House of Recovery and Fever Hospital, Cork-street, Dublin, 1829.)

Dr. Clanny has adopted views nearly similar, from observation of the gradual changes in the blood from the commencement to the decline of fever. (Lecture upon Typhus Fever.) He has shown the difference in the component principles of the blood according to the stage of the disease, that the blood loses a proportion of its solid ingredients as the fever advances, which it afterwards gradually regains as the fever declines. He firmly asserts his belief, however, in these various changes in the blood being the effect of disease in the solids.

The idea that certain forms of fever originate in a morbid condition of the blood, is further supported by the peculiar symptoms which follow from poisonous wounds in dissection, or in the preparation of putrid game. The symptoms in these cases closely resemble those of typhus fever, and the description given of the effects of introducing putrid fluids into the veins of animals. Whether the opinion of the old writers, that in fevers originating in contagion the contagious principle alters the properties of the blood, be correct or not, we certainly think the strong analogy in the cases alluded to tends to confirm the supposition of typhoid fevers originating in diseased blood.

There has been much ingenious disputation on the question, whether the alteration in the blood be the cause or the effect of the disease in the solids. It appears probable, if not certain, from what has been advanced, that in a certain class of fevers (typhoid) the blood is primarily diseased, and that certain changes in one or more organs take place as a consequence, or secondary effect. On the other hand, from various circumstances, as well as from some recent experiments (by Dupuytren, Mayer, and Dupuy), it may be inferred that the solids, more particularly the nervous system, effect most important and sensible changes in the constituent principles of the blood.

On this subject Andral remarks that "no line of demarcation can with strictness be drawn between the blood and the solids. Physiologically speaking, it is impossible to conceive that one of these two parts of the same whole could be modified without the other being so likewise. On the one hand, inasmuch as the blood nourishes the solids, and as, without its presence, they cannot support life, the state of the solids cannot but be influenced by the state of the blood. The chemist might as well say that the nature of a body does not depend on the nature of the elements that compose it. On the other hand, the solids, considered with respect to their relations to the blood, form but two classes; the one contributing to *make* the blood, such as those concerned in the actions of absorption, digestion, arterial circulation, and respiration; the other contributing to *unmake* it, those, namely, concerned in the actions of venous circulation, secretion, and nutrition. No one solid, therefore, can undergo the slightest modification without producing some derangement in the nature or quantity of the materials destined to form the blood, or to be separated from it. Physiology then leads us to the conclusion, that every alteration of the solids must be succeeded by a modification of the fluids. Viewed in this light, there is no longer any meaning in the disputes between the solidists and humorists; the system appears to constitute but one great whole, indivisible in the state of health as well as in that of disease. The division of the parts of the body into solids and fluids seems to be a distinction of small importance, and one that is not always just, since it ceases to exist in the intimate structure of the organs, in which all the grand vital phenomena take place, and in which also occur all the changes that constitute the morbid state."

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* Memoir on Contagion, more especially as it respects the Yellow Fever, by Nathaniel Potter, M. D. Baltimore, 1818. p. 53.

It is probable that when certain external agents alter the properties of the blood, and thus induce fever, the changes take place in a very gradual and almost imperceptible manner. If, for example, an individual who has been accustomed to a pure air, be exposed to an unhealthy tainted atmosphere, or to marsh miasms, or if his food be of an unwholesome kind, or insufficient as to quantity, he is observed gradually to droop, to emaciate, and to lose his natural energy: he may for a long time struggle against this incipient form of disease, but at length symptoms of fever become developed. Under these circumstances, it is very probable that the blood has been undergoing gradual changes from the time that the system was first exposed to the causes adverted to; in the one case, the unhealthy atmosphere has altered the qualities of the blood; in the other, the unwholesome kind or scanty supply of food has produced bad chyle, which, by entering the circulation, taints the general mass of the blood.

It would thus appear, that when the various exciting causes produce fever by their action on the solids, the febrile phenomena take place speedily, while those acting on the blood produce their effects in a gradual, slow, and often imperceptible manner.

Treatment of Continued Fever. — Before deciding on the measures to be adopted in the treatment of any disease, it is requisite that the practitioner should have correct ideas of its nature in order that the principles or indications of cure may be successfully applied.*

In no class of maladies is this more essential than in continued fever, which we have seen, assumes so many modifications, arising chiefly from the various circumstances in which it originates, and the local inflammations with which it becomes complicated. When those points are considered, it will be evident, that the treatment must be adapted to the circumstances of each case. Not only are the precise form of the fever, and the presence or absence of local congestion or inflammation to be ascertained, but the duration of the disease, the age, the sex, and the constitution or powers of the individual—the previous habits or mode of life, the effects of remedies which may have been previously employed, and the character of the prevailing epidemic. Sydenham's remark should ever be imprinted on the practitioner's mind, that the same method which cures in the middle of the year may possibly prove destructive at the conclusion of it; and when he had fallen on the method of treating any species of fever, he was always successful till that species became extinct and a new one arose, when he was again doubtful how to proceed; and, notwithstanding his utmost caution, could scarcely ever preserve his first patients from danger, till he had thoroughly investigated the nature of the disorder.

The ancients entertaining the opinion that the phenomena of fever were the result of certain efforts of the system to expel some noxious agent, observed most carefully the various changes which took place when the symptoms were allowed to run their natural course. They, consequently, watched the spontaneous efforts of the system, and the supposed salutary effects of certain critical evacuations in controlling or removing the various morbid actions. Founding their indications on attentive observation of the various means by which the system apparently effected a natural cure, they did not attempt to interfere with its operations, but were contented to assist these natural efforts by such measures as they conceived most likely to conduce to this end.

Accordingly, the older physicians attempted the cure of fever by promoting, by artificial means, such evacuations as are occasionally noticed to occur when the disease is allowed to pursue its own course, uninterrupted by the interference of art. The symptoms or evacuations which are observed in the spontaneous resolution of fever, and which physicians have attempted to induce by remedies, are vomiting, diarrhœa, sweating, and hemorrhage.

Another mode of treatment has been proposed on the principle that, as fever is frequently a fatal disease, the attention of the practitioner should be directed chiefly to combat the more dangerous symptoms which arise in its progress; and we confess, that, in our judgment, this plan is not only more philosophic, but that which is most successful in practice.

We have just stated the indispensable necessity of ascertaining the form of the fever before the indications of treatment are considered; and, as the measures to be pursued are essentially different, according to the type of the disease, we shall treat of the management of each variety in the order of the description given in the history.

Treatment of simple fever.—In the management of the milder as well as the more severe cases of the common epidemic fever, the practitioner would often be more successful in his endeavours to cut short the disease, or to lessen its duration, were medical aid resorted to on the first feeling of indisposition. It too often happens that the primary stage is altogether neglected; the patient, hoping that the symptoms will pass off, and unwilling to believe that he is seriously indisposed, continues to pursue his usual avocations, until he is compelled by increasing illness to resort to medical aid.

In investigating the symptoms of fever, however apparently mild, the condition of the several organs should, in the first place, be carefully examined by every means within our reach, that we may be certain there is no lurking disease to keep up the febrile excitement. The patient, his relatives, and sometimes his medical attendant, are too apt to suppose, that if there be no pain to attract attention to any organ, there is no local disease going on. A very short acquaintance with acute disease, however, will convince the practitioner, that, besides pain, (which in many cases of local inflammation is entirely wanting,) there are other symptoms, the presence of which indicates both the seat and intensity of the local affection. Again, when we find one organ more particularly affected than another, although the disturbance be merely functional, this over-action, which often depends on irritation or congestion, should be watched and controlled, lest it should pass into inflammation.

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* Sentio autem, nostræ artis incrementum in his consistere, ut habeatur historia sive morborum omnium descriptio, quoad fieri potest, graphica et naturalis, praxis seu methodus circa eosdem stabilis ac consummata.—*Sydenham.*

Having ascertained the condition of the several organs, and being satisfied that there is no local complication, the modified antiphlogistic treatment is to be adopted. Strict quietude should be enjoined; consequently confinement to bed, or at all events to the horizontal posture, abstinence and cessation from all mental effort, are indispensable; fortunately, indeed, the lassitude and languor which attend the very first approach of fever, render the patient averse to exertion either of body or mind.

In every form of fever, the expediency of bloodletting is to be considered. This remedy is not to be indiscriminately employed; but the circumstances of each case weighed, before the practitioner decides on employing or withholding the lancet. We shall therefore consider the circumstances which should regulate the employment of this remedy, as we treat of the measures to be pursued in the various forms of fever.

In the milder varieties of simple fever, bloodletting is seldom required, unless the patient be of a full habit, or the symptoms indicate unusual excitement. Under these circumstances, a moderate bleeding at the commencement of the disease is often of much service in mitigating the symptoms, and preventing local inflammation. Indeed, there are few cases of the acute fever of temperate countries, in which, at the onset, a moderate bleeding is not advisable; and in the fevers of hot climates, which often run their course with alarming rapidity, this evacuation is indispensable.

Physicians of observation and experience have often remarked the different characters of epidemic fever, and are therefore aware that at one period, or in some epidemics, the type of the fever renders the bold use of the lancet necessary, while at another season, or from some peculiarity in the epidemic, which is quite inexplicable, the system will not bear with safety the bold treatment which the previous epidemic required. The character of the prevailing fever, as well as the stage and symptoms of the case, must determine the propriety of bloodletting, and the extent to which it should be carried. Even when, from the nature of the prevailing epidemic, bloodletting is indicated, it should be restricted to the early stages, unless some symptoms arise in the later periods to require it. This remedy is also to be prescribed with great circumspection when the patient is of a feeble constitution, or advanced in years, of intemperate habits, or if there be chronic visceral disease. In such cases, unless there be symptoms which require bloodletting, the modified antiphlogistic treatment is to be adopted, viz. strict rest, antimonials, and purgatives; and should local congestion or inflammation arise, they are to be arrested by the topical abstraction of blood.

The freedom with which some physicians speculate on the safety of large bleedings in fever has led to very improper notions on this point of practice. A little experience at the bed-side, and attentive observation of the ever varying circumstances which individual cases of fever present, will soon enable an observing, and what is of more importance, a candid practitioner, to form a true estimate of this powerful remedy. Were every patient who is seized with fever to be bled indiscriminately, without regard to age, constitutional powers, previous habits, and mode of living, and more especially to the prevailing character of the epidemic, many lives would be sacrificed by a remedy, which, when judiciously employed, is an anchor of safety.

The action of full vomiting, by the shock given to the system, and by determining the blood to the surface, being frequently followed by marked relief of the general symptoms, has led to the administration of emetics in the early stage of fever. They are therefore to be employed in cases in which bloodletting is considered unnecessary, or in conjunction with this remedy. There are few circumstances which forbid their exhibition, so that, unless, as sometimes happens, the disease be ushered in by spontaneous vomiting, or epigastric tenderness, the patient be plethoric, or there be determination to some organ, more especially to the head, or marked prostration, a scruple of ipecacuanha, with one grain of tartar emetic, may be given in a draught, and its operation promoted and rendered as little distressing as possible by copious draughts of tepid fluids.

The exhibition of purgatives in fever requires as much discrimination as bloodletting. Before the excellent practical work of our much respected friend and preceptor, Dr. Hamilton, appeared, the minds of physicians were fettered by the fear of debility, one of the supposed direct causes of death in fever, and purgatives were prescribed with great diffidence, lest by their operation the spasm of the extreme vessels, and the consequent debility, might be increased. This venerable physician pointed out, in his admirable work, and illustrated by his practice, the advantages of a more liberal employment of purgative medicines in fever. The successful result of this method of treatment, and the inferences which Dr. Hamilton deduced, tended materially to withdraw the minds of physicians from the erroneous theory of Cullen, and certainly laid the foundation of the more extended views of the nature and treatment of fever which have been recently introduced.

The principles upon which this method of treatment should be employed have been misunderstood. If Dr. Hamilton's observations be studied it will be apparent, that while he recommends the free evacuation of the bowels in the early stages of fever, he deprecates their indiscriminate administration. After detailing the circumstances which first led to his adopting the treatment of fever by purgatives, he states, "if this be a just view of the case, the plain inference is, that, while purgative medicines preserve a regular state of the body, they do not aggravate the debilitating effects of fever. The complete and regular evacuation of the bowels, in the course of fever, is the object to be attained. Within this limit, I have had much satisfaction in prosecuting the practice; nor have

I, in a single instance, had occasion to regret any injury proceeding from it; for I am not an advocate for exciting unusual secretion into the cavity of the intestines, and for procuring copious watery stools; these, while they are not necessary, might increase the debility so much dreaded." (Observations on the Utility and Administration of Purgative Medicines in several Diseases, by James Hamilton, M. D.) With these precautions, no class of remedies is more beneficial in relieving the primary symptoms of fever, in preventing the accession of more formidable symptoms, and thus shortening the duration of the disease. In the more advanced stages, however, purgatives are injurious by draining too much from the system through the bowels; it is sufficient that the alimentary contents be expelled; and should the secretions, which ought to be daily inspected, appear to be vitiated, mild aperients, containing small doses of mercurial preparations, should be from time to time exhibited.

We cannot deprecate too strongly the practice of administering active cathartics in fever without reference to the circumstances of the case, and more especially to the powers of the patient. Such *indiscriminate* use of purgatives originates in *misconception* of the principles on which they should be employed. These remedies should not be prescribed merely because fever exists. In some epidemics and at certain seasons, we have seen that there is a tendency to diarrhœa. It is almost unnecessary to state that under such circumstances aperients are to be withheld, or those only given which tend to correct the morbid secretions.

The doctrines of Broussais as to the pathology of fever have had a salutary influence in checking the abuse of purgatives in the treatment. There is, no doubt, a material difference in the type of the fevers of France compared with those of Britain; there is a greater tendency to gastric irritation, and to those changes in the mucous membrane of the bowels which result from inflammation. We do not, therefore, wonder at the proscription of purgatives by the French physicians, and their extravagant denunciation of the British treatment of fevers. The fact seems to be, that if British physicians were called upon to undertake the treatment of fever in France, they would be less lavish of their purgatives; and on the other hand, after the French physician had seen the character of fever in this country, and thrown aside his preconceived notions and scholastic prejudices, he would acknowledge the utility of the judicious administration of purgatives in the treatment of the fevers of Britain.

The choice of the aperients employed is of less moment than their due regulation. In the beginning of fever, especially when there is considerable excitement, the more active purgatives, such as calomel combined with rhubarb, or senna with a neutral salt, may be given. Afterwards, such as ensure a full evacuation of the bowels, according to the indication to be fulfilled, are to be employed. In cases in which purging is required, we have found a powder, containing three grains of calomel, two of James's powder, and eight of rhubarb, given at bed-time, during the stage of excitement, answer every purpose; and if a more free action of the bowels be necessary, half an ounce of castor oil, or an aperient draught, may be given in the morning. When the skin becomes cool, and the tongue begins to clean, the calomel and antimonial powder may be omitted, and the regulation of the bowels managed by rhubarb, castor oil, or senna, so as to ensure one or two moderate evacuations daily, while any symptoms of fever remain.

Sometimes the stomach is so irritable, that ordinary aperients are rejected, and even increase the irritation; in such cases the bowels are to be opened by injections, by which the large intestines are unloaded, and the peristaltic action of the upper part of the alimentary canal is promoted.

When the fever is fully developed, the skin becomes steadily warmer than natural, especially towards the evening. The abatement of the febrile heat being generally followed by marked relief in the symptoms, and in the patient's general sensations, various means are employed with the view of reducing it. Those means which induce perspiration have been employed with this object.

This attempt to imitate nature was strongly inculcated by Cullen. Spasm of the extreme vessels being the supposed cause of the phenomena of fever, it was imagined that every measure which tended to diminish or remove this state of the cutaneous exhalents would have the effect of subduing the disease. Upon these grounds, the employment of diaphoretics in fever was suggested, and these remedies now constitute a part of the treatment of all febrile diseases.

It should, however, be observed, that although a spontaneous or natural diaphoresis has always a salutary effect in reducing not only morbid heat, but the other febrile symptoms, and occasionally accompanies the crisis of fever, the same relief is scarcely ever observed to follow diaphoresis induced by artificial means; and if it be attempted by stimulating or heating drugs, or confining the patient to a warm room, and loading him with bed-clothes, the febrile symptoms, instead of being allayed, are increased. If, however, moisture of the skin can be promoted by saline preparations, such as the acetate of ammonia, with antimony or ipecacuanha, assisted by tepid diluents, the morbid heat of the skin is generally reduced, and the feelings of the patient and general symptoms are ameliorated.

The employment of refrigerants is another mode of diminishing the morbid heat of the skin in fever. Various internal remedies are prescribed with this view. The mineral and vegetable acids being useful in quenching thirst and cooling the surface, either may be employed according to the feelings of the patient; the most agreeable and convenient form of the latter is, the native vegetable acids contained in fruits, such as the lemon, orange, and tamarind. These may be taken in moderation if they agree or the bowels be not purged. Sometimes the saline refrigerants, such as the citrate or the nitrate of potash, are employed in preference to the acids. Not unfrequently the patient has a desire for cold drinks; the most grateful during the first few days of the fever being cold spring water, which, if preferred, may be freely allowed, and the diluted sulphuric or nitric acid occasionally added.

Very little dependence, however, should be placed on diaphoretics or refrigerants; their efficacy is very doubtful, while they often seduce the practitioner from more active measures.

A more effectual mode of reducing the morbid heat is by the free external application of cold. The admission of cool air is of much importance in all acute diseases, but more especially in fever. Those who are conversant with the treatment of fever among the poor, are well aware of the favourable changes in the symptoms which are often rapidly produced, after patients are removed from their filthy abode to a well-ventilated chamber, or to the ward of an hospital. The whole complexion of the disease is frequently altered in a few hours. In every case of fever the temperature of the apartment should be duly regulated; the air renewed from time to time, the linen (both of the bed and of the patient) should also be frequently changed (once a day if practicable), and the bedclothes adapted to the heat of skin and feelings of the patient.

A more direct mode of applying cold in the treatment of fever is the application of cold water. Though this practice appears to have been known to the ancients, and to have been occasionally employed in modern times, it was not generally adopted as a remedy in the treatment of fevers till Dr. William Wright, formerly of the Island of Jamaica, published an account, in the London Medical Journal for 1786, of the successful treatment of some cases of fever, by the ablution of the patient with cold water. He first adopted this practice in his own case, and states that he was encouraged to try it from personal experience of the effect of cool air in mitigating his pains. He succeeded in arresting the progress of the fever after twice applying the cold effusion. The successful issue of this case induced other physicians to give the plan a fair trial. To the late Dr. Currie, of Liverpool, however, is due the merit of having first attempted to regulate this practice from accurate observation of its effects.

When the cold affusion is to be employed, it is proper to ascertain with accuracy the temperature of the patient. The instrument best adapted for this purpose is the mercurial thermometer with a small bulb, and curved at the end. The bulb is to be introduced under the tongue with the lips close, or under the axilla, the heat in these two situations being found by experiments to correspond exactly with, and to give a just indication of, the heat of the surface of the body.

The mode of applying the cold affusion is to have the patient stripped naked, and three to five gallons of water, at the temperature of 40° to 60° (Fahrenheit), thrown over him. The temperature of the water, however, must depend on the season of the year. The average temperature of water may be taken from 40° to 50°—during the summer months it varies from 60° to 70°. The degree of cold, however, is of less consequence in abating the symptoms than is generally supposed.

Water alone may be used, or vinegar or common salt may be added. There may be some slight advantages in the addition of these ingredients. Dr. Currie was of opinion that salt water, besides being more grateful to the feelings of the patient, might be applied to the surface for a length of time with much less hazard. This may be true; but we apprehend the chief advantage of the application of cold in any form, is the rapid abstraction of heat, and the sudden, general, and powerful shock given to the whole system, which induces a sudden salutary re-action.

The effect of the cold affusion, when it is applied with due precaution, is to diminish the morbid heat of skin, lower the pulse, and to induce perspiration and sleep.

As a general rule, the sooner the affusion is applied after the irregular chills of the first stage is over the better, provided the heat of the skin is steadily above the natural standard. According to Dr. Currie, the safest and most advantageous time is, when the exacerbation is at its height, or immediately after its declination is begun. The heat at this period rises one or two degrees in the central parts of the body, and still more on the extremities, above the average heat. Dr. Currie, therefore, generally directed its employment from six to nine in the evening, though it may be safely used at any time of the day under proper regulations.

The following precautions are recommended by Dr. Currie, when the cold affusion is contemplated.

1. This remedy should never be used when there is any considerable sense of chilliness, although even the thermometer indicate a morbid degree of heat. If the affusion of cold water on the surface of the body be employed during the cold stage of the paroxysm of fever, the respiration is nearly suspended, the pulse becomes feeble and fluttering and of incalculable frequency, the surface and extremities are doubly cold and shrivelled, and the patient seems to struggle with the pangs of instant death. Under such circumstances, as Dr. Currie states, the repeated affusion of a few buckets of cold water would extinguish life.

2. Neither ought the cold affusion to be employed when the heat, measured by the thermometer, is less than, or equal to, the natural heat, notwithstanding the patient feel no sense of chilliness. This is sometimes the case towards the last stages of fever, when the powers of life are weak.

3. It is also necessary to abstain from the use of this remedy when the body is under profuse sensible perspiration; and this caution is more important in proportion to the continuance of this perspiration. In the commencement of sweating, especially if it has been brought on by violent exercise, the affusion of cold water on the naked body, or even immersion in the cold bath, may be hazarded with little risk, and sometimes may be resorted to with great benefit. After the sweating has continued some time and flowed freely, especially if the body has remained at rest, either the affusion or immersion is attended with danger, even though the heat of the body, at the moment of using it, be greater than natural. Sweating is always a cooling process in itself, but in bed it is often prolonged by artificial means, and the body prevented from cooling under it to the natural degree by the load of heated clothes. When the heat has been thus artificially kept up, a practi-

tioner, judging by the information of his thermometer only, may be led into error. In this situation, however, Dr. Currie states that he has observed that the heat sinks rapidly on the exposure of the surface of the body even to the external air, and that the application of cold water, either by affusion or immersion, is accompanied by a loss of heat and a deficiency of re-action which are altogether inconsistent with safety. (Currie's Medical Reports.)

According to the experience of Dr. Currie, if employed on the first or second day with the precautions recommended, the progress of the fever is often checked; but it is seldom successful when applied so late as the third or fourth day, though when administered about the eighth or tenth day, or even later, it moderates the symptoms and shortens the duration of the fever.

When the fever is advanced, the heat of the water should not be more than 15° or 20° below the heat of the body. Indeed, when the patient is weak, or when the fever has run on to the ninth or tenth day, sponging the body with cold or tepid vinegar and water is preferable to the cold affusion.

The advantages of the cold affusion in the acute or inflammatory forms of fever have been acknowledged by almost every writer or practitioner who has adopted the practice. Our own experience of it certainly accords with that of others as to its efficiency in reducing the febrile heat and moderating the symptoms. We freely confess, however, that there are few patients who can be induced to submit to a remedy so inconvenient and so repugnant to their feelings; and unless the practitioner can show urgent reasons for its adoption, he will generally find both the patient and relatives resist the practice. We have certainly never had the opportunity of witnessing a single case out of a considerable number, to which the cold affusion was applied, in which the fever was cut short, though all the patients felt afterwards greatly relieved, and in some the duration of the fever was probably shortened. The practice is best adapted to inflammatory fever (synocha), and more especially to the fevers of hot climates, which are accompanied with much greater excitement than those of temperate countries. It should, however, be ascertained in every case, before such a powerful remedy is administered, that there is no visceral inflammation: were such a powerful shock given to the system under such circumstances, dangerous and even fatal consequences might ensue.

We are, for the reasons stated, disposed to recommend in preference the cold sponging or washing of the surface, either with cold water or with vinegar and water, whenever the skin is decidedly hotter than natural. This mode is easily applied, gives the patient no fatigue, and checks those irregular feelings of heat, especially in the palms of the hands and soles of the feet, which are so annoying to the patient, besides, what is of some consequence, producing no alarm. It may not, we admit, be so permanent in its effects as the cold affusion, and certainly cannot be expected to cut short or even to moderate the duration of the fever, but as a grateful means of relieving morbid heat, reducing the pulse and tranquillizing the patient, we submit that it is equally efficacious. This circumstance, with the advantages already stated, has always led us to give the cold sponging a decided preference to the cold affusion.

Dr. Currie applied the *cool* affusion in cases where, from the continuance of the fever or the debility of the patient, the cold affusion was inadmissible. The temperature of the water employed for this purpose should be from 75° to 87°. It is, however, liable to so many objections, and has so few advantages, that in the present day it is almost entirely abandoned.

The warm or tepid affusion (from 87° to 97° Fahrenheit) has been proposed in feeble habits, and when the heat is little above the natural standard; and, according to Dr. Currie, the heat is lowered as speedily by the tepid as by the cold affusion; indeed, he asserts that in some cases the heat is more speedily lowered by tepid water. The tepid affusion is applicable to every case of fever in which the cold affusion is recommended. Its effects, however, are less permanent than those of the cold affusion, besides that it is admitted, even by Dr. Currie, that it never succeeded in shortening the duration of fever; so that, from the fatigue and inconvenience attending its application, and its doubted utility, it is now scarcely ever recommended.

Washing or sponging the body with tepid vinegar and water is much employed to reduce the morbid heat of fever, and certainly, so far as the feelings of the patient are to be consulted, it is decidedly more agreeable than the application of cold. Some patients prefer cold, others tepid sponging, the former being more grateful in the summer, the latter in the winter months. The choice may, therefore, be left to the patient, either mode of aspersion being preferable to the affusion.

The effect of mercury as an alterative, improving the secretions in fever, is so beneficial, that unless there be some special circumstance in the case to forbid its administration in fever, it should never be omitted, more especially in the fevers of warm climates, or in the more acute forms of fever of temperate countries. The large quantities of calomel (ten grains every three hours) mentioned by Chisholm and other writers, as necessary in the fevers of warm climates, are never to be attempted in the treatment of the fevers of this country.—Mercury is more especially useful when the tongue is much coated, the secretions of the mouth clammy and unpleasant, and the stools dark and offensive. It is frequently alone sufficient to regulate the bowels, while at the same time the tongue becomes more clean, and the clammy disagreeable state of the mouth disappears under its use. It is not necessary to push its administration so as to induce salivation, a mild action on the gums being all that is required. When this is effected, the febrile symptoms generally abate. It may be given alone or in combination with any aperient, though we prefer giving two or three grains of the pil. hydr. or the hydrargyrum cum creta, at intervals of six or eight hours; and should an aperient be required, it may be combined with the mercurial preparation, or given alone, according to circumstances. In some individuals mercury induces such irritation as to forbid its internal administration; in such cases it should be exhibited in the form of inunction: a drachm of the ung. hydr. may be inserted once a day in the axilla, where absorption goes on rapidly without the inconvenience of friction.

We have often observed the singular immunity of persons under fever from the effects of mercury. This is proved from their resisting this remedy during the continuance of the fever; but as soon as the fever begins to disappear, the mercurial action often becomes perceptible; indeed, patients who could bear the free exhibition of mercury during the fever, but in whom the remedy had been discontinued, are often easily affected by an inconsiderable quantity of this mineral in the period of convalescence.

We have stated our belief that synocha, or inflammatory fever, is rarely observed in this country, the few cases which occur (generally in the spring) forming a comparatively small average proportion of the ordinary epidemic fever of Britain.

In the treatment of this variety, it is necessary to keep in mind, not only the more acute nature of the fever, but the greater tendency to local inflammation. It consequently requires more bold and decided antiphlogistic measures, especially bloodletting, purging, and mercury. As it generally occurs in young plethoric persons, bloodletting should always be prescribed in the onset; this not only moderates the violence of the symptoms, but diminishes the tendency to local inflammation.

We have entered at some length into the detail of the various measures which are employed in the treatment of common epidemic fever. It is to be observed, however, that the majority of cases of mild fever do not require the several measures we have pointed out. It is impossible to lay down a general rule which will apply to every case; in one instance, the mildest measures will be sufficient to check the progress of the fever; in a second, more active treatment, bloodletting, smart purging, and the free application of cold, are necessary; in a third, in addition to these measures, mercury may be required. In short, the application of remedies must be regulated and directed by the judgment of the practitioner, according to the symptoms and the character of the epidemic.

2. *Treatment of complicated Fever.*—A fever, simple at its commencement, (as far as the negative evidence of symptoms warrants the conclusion,) may become suddenly complicated with local inflammation. The symptoms by which such complications in the several organs may be detected have been pointed out, and although, as a general rule, there can be no question as to the expediency of general bloodletting in complicated fever, it is not advisable to take away the same quantity as in common inflammation. There are modifying circumstances in idiopathic fever on which local inflammation has supervened, so that we find by experience the powers of the patient must be saved for the after-conflict, as the fever will certainly run on for some time after the local affection has been subdued.

Dr. Wilson Philip states, "that when visceral inflammation supervenes on idiopathic fever, we must let blood more cautiously than where the former disease exists alone; and in the determinations of blood to particular parts, so apt to occur in fevers, which more frequently consist in distension of the larger vessels of the part than actual inflammation, that is, distension of the capillaries, unless the general excitement is very considerable, it is better to attempt their removal by local than general bloodletting. If there be any exception to this rule, it respects congestion in the head, because, from the nature of the circulation, congestion there is more intimately connected with a state of general excitement than in other parts of the body."

While, therefore, the lancet is to be freely employed if the symptoms demand it, the system is not to be drained of a single ounce of blood more than is absolutely necessary.

The topical abstraction of blood in cases of local inflammation is often very beneficial, and in less urgent cases, sometimes alone sufficient to subdue the local disease. Not unfrequently inflammation creeps on in an insidious manner in feeble exhausted habits; or, as often happens, the local symptoms have been entirely overlooked at the commencement; in these instances general bleeding is inadmissible, and the topical abstraction of blood is the only mode which can with safety be employed. Again, this mode will also often require to be combined with the general measures, or should local inflammation threaten to re-appear, it may be instantly checked by leeching or cupping, and at much less expense to the general powers.

The nervous system being much involved in fever, the brain, but more particularly its investing membrane, the arachnoid, is more liable to become inflamed in its progress than any other organ; the changes which take place in this delicate and important structure being, as we have seen, in many instances, the immediate cause of death. When the symptoms indicate the existence of inflammatory action within the encephalon, no time must be lost in adopting suitable measures. The degree of sensorial disturbance, the presence or absence of pain, the existence and kind of delirium, whether of the high or low character, will point out the nature of the cerebral symptoms. If there be pain in the head, flushing of the face, hot skin, thirst, rapid pulse, acute delirium, (especially towards night,) and watchfulness, we have sufficient evidence of cerebral inflammation to warrant general bleeding, (when there is much excitement from the temporal artery or jugular vein,) followed, if necessary, by the local abstraction of blood from the forehead or nape, and a cold lotion to the scalp.

Another remedy of great power in subduing inflammation of the brain is the affusion of cold water on the scalp. This has been generally termed the *cold douche*. It is as simple in its application as it is powerful in its effects. The patient is raised in bed, the head is then held over an empty vessel, and cold water from a large jug poured on the scalp, the stream being gradually raised as the patient can bear it. A considerable shock is at first produced, but the patient, if he be sensible, expresses great relief, and generally requests it may be repeated. We have frequently seen threatened renewals of cerebral inflammation promptly checked by this treatment, which should always be employed, in some cases as an auxiliary to the other measures, or it is often alone sufficient to keep down the inflammation in weak habits, or when the further abstraction of blood is of doubtful propriety.

The application of blisters to the scalp in cerebral inflammation requires consideration. The too common plan of blistering the head in such instances, before the excitement is diminished by bloodletting, is reprehensible. The application of blisters to the head in fever should be confined to those cases in which there is danger of the inflammatory action terminating in effusion, or to that particular state of the brain in inflammation, which, though there be no effusion, is attended by coma. Hence when, notwithstanding depleting measures have been judiciously applied, the patient becomes drowsy and insensible to surrounding objects except when roused, a blister may be advantageously applied to the occiput, while an iced evaporating lotion is kept on the forehead, and the system brought under the influence of mercury conjoined with digitalis and squill, so as to promote the action of the kidneys.

There is a form of low delirium in fever which requires to be distinguished from that arising from inflammation of the brain or its membranes. It arises from some peculiar condition of the brain with which we are unacquainted, and may be distinguished from the acute form of febrile delirium, by the pallor of the face, the bloodless appearance of the conjunctiva, the softness of the pulse, the cool state of the scalp, and the absence of muscular twitchings. It occurs chiefly in feeble exhausted habits, and frequently in persons who have suffered large losses of blood in the treatment. In other instances, it may be traced to intestinal irritation, or some of those lesions in the bowels which so frequently accompany continued fever. This sympathetic delirium is not relieved, but invariably increased by the abstraction of blood. It is best managed by small quantities of nourishment and opiates, with a blister to the nape.

A similar state of the nervous system is often observed towards the termination of other acute and chronic diseases, and also in states of exhaustion induced by injudicious bloodletting or spontaneous hemorrhage.

No class of medicines is more efficacious in removing cerebral inflammation than purgatives; so that, unless there be some special circumstances to forbid their employment, they should form part of the treatment in such cases.

When we have succeeded in arresting the cerebral inflammation, the patient must be strictly watched for some days, as the fever, though moderated, is not extinguished, so that the capillaries are very liable to resume the same action, and thus renew the local disease.

Bronchitis is the most frequent form of pulmonary disease in fever. It is in general easily detected, unless it assume the latent form, when it can only be recognised by auscultation. In severe cases of fever, more especially when the brain is much affected, the frequent application of the stethoscope is indispensable, in order to discover not only the existence but the intensity of this complication. The milder forms of symptomatic bronchitis subside under the use of the measures employed in the general treatment. It is occasionally necessary in addition to apply a few leeches to the chest, and to allay the cough by demulcents.

In more severe cases, more active treatment is necessary. General bloodletting possesses less control over this complication than might be expected. More benefit is derived from cupping or the application of leeches to the chest, with warm fomentations diligently applied at intervals of two or three hours. The local bleeding is to be followed by antimonials and a blister. If the bronchitis be not arrested by these measures, large doses of the tartrate of antimony are to be administered. To the efficacy of this remedy we can bear testimony from ample experience. One grain, or in more severe cases, two grains of tartar-emetic dissolved in an ounce of any aromatic water, may be taken every two, three, or four hours, according to the exigency of the case. The remedy almost invariably produces vomiting at first, (unless there be considerable torpor from the condition of the brain,) but after three or four doses have been taken, the vomiting ceases, and *tolerance* becomes established. In general this remedy moistens the tongue, and produces softness of the skin, or even diaphoresis; it often, however, produces no sensible effect, except that the bronchitis abates and gradually disappears under its use. When the more urgent symptoms give way, the same dose may be given at more distant intervals, till the remedy be no longer required.

It is necessary, sometimes, to endeavour to allay the distressing vomiting induced by this medicine. This is frequently effected by giving the dose of the tartar-emetic in a common saline effervescing draught, to which a few drops of laudanum may be occasionally added.

If it produce purging it must be conjoined with opium; and if, notwithstanding this combination, the purging continue, the antimony must be suspended. In all cases, therefore, when the bowels are irritable, this remedy must be withheld, and the pulmonary symptoms arrested by other measures. If, again, the symptoms of fever be accompanied with great prostration, or if after a fair trial it appear to lower the general powers without subduing the symptoms in the chest, it should be at once withdrawn.

When pneumonia supervenes on fever, the treatment is to be conducted on similar principles. General bloodletting is certainly more efficacious in subduing inflammation of the substance of the lung than of the bronchial membrane, though, unless the symptoms be very urgent, we prefer free local depletion, followed by the exhibition of the tartar-emetic as just recommended, or by calomel and opium with counter-irritation. The calomel and opium may be given, in the proportion of two grains of the former and half a grain of the latter, every three or four hours, till the local symptoms are relieved, when it may be given at more distant intervals, and afterwards withdrawn.

Our experience does not lead us to form a very high opinion of the efficacy of expectorants in symptomatic bronchitis or pneumonia. We have, however, observed good effects from the addition of small doses of ipecacuanha wine, or of the anti monial wine, to the common saline diaphoretic draught. Still we do not place much confidence in this class of remedies. When the patient is unable, from increasing prostration, to expel the expectoration, carbonate of ammonia, in doses of eight or ten grains in almond emulsion, or decoction of Senega, appears often to assist its expulsion.

The occurrence of acute pleuritis during fever is by no means frequent; and when it does take place, it is chiefly in the more advanced stage, or during convalescence. The treatment is very similar to that of pneumonia — local bleeding, calomel and opium, blistering, and purging. Tartar emetic seems to possess little influence over membranous inflammation, and consequently is inapplicable to pleuritis.

The more dangerous form of pleurisy is the chronic, the danger arising from its coming on in an insidious manner, without pain, much acceleration of the breathing, or cough. It is not easily recognised even by auscultation till liquid effusion to a considerable extent has taken place, when the dull sound on percussion of the diseased side, the absence of the respiratory murmur, and the peculiar sound of the voice, (ægophonia,) point it out. The effect of curative measures depends on the state of the membrane, and the extent of the effusion. When the fluid is so considerable as to render its absorption improbable, the operation of empyema is the only resource.

It is proper, however, to bear in mind, that in a considerable proportion of cases of fever, in which pulmonary symptoms predominate, the chest affection is the primary disease, of which the fever is only symptomatic. Many of those cases commence by slow insidious pulmonary inflammation, which, from the comparatively little disturbance it causes, is often allowed to run on until a more acute attack brings the disease under the care of the physician, who has thus to contend with neglected inflammation, over which the most energetic measures too often exert an inefficient control.

When fever is accompanied with symptoms denoting disturbance of the gastric organs, a moderate bleeding from the arm, if the pulse be full, or in less urgent cases, the application of leeches to the pit of the stomach, is often sufficient to allay the irritation. Notwithstanding the relief afforded by bloodletting, it does not appear that the vomiting and epigastric tenderness depend on inflammation, as Dr. Cheyne states that in a case in which considerable tenderness of the epigastrium existed during a great part of the disease, on opening the body not the slightest morbid appearance could be discovered, except a small quantity of bloody serum effused into the cavity of the abdomen, and a very inconsiderable blush in the mucous membrane of the stomach at the cardiac orifice.

When gastric irritation continues during the course of the fever, the plan of treatment recommended in Dr. Cheyne's account of epidemic gastric fever is to be pursued.

We have seen that follicular disease of the intestines, whether primary or secondary, may be going on without being attended by any symptom of gastric disturbance. When, in addition to the ordinary symptoms of fever, the bowels are irritable, and the tongue is morbidly clean and red, or coated at the root, we may infer the existence of gastro-enteritis, or this follicular disease. Our object must then be to prevent, if possible, the destructive changes which take place, whether the intestinal affection be primary, or have supervened in the progress of the fever.

The local abstraction of blood from the surface of the abdomen (particularly from the right iliac region) is to be pursued, to an extent proportionate to the powers of the patient, and the probable duration of the affection. From twelve to eighteen leeches are to be applied, and the abdomen afterwards enveloped in a warm poultice, renewed every two hours. The leeching may be repeated every day, every second day, or at more distant intervals, according to circumstances. The more early the effective measures are resorted to, the greater the chance of preventing the stage of ulceration, which we are convinced cannot be recognised by symptoms. We are aware that Dr. Bright considers the ochry diarrhœa to be diagnostic of intestinal ulceration. We admit that in some cases in which we have found ulceration after death, the stools had this character; but in other instances the greatest variety, both as to colour and consistence, has been observed; in a few the stools were solid up to the time of death, and in examining the intestines there was a considerable quantity of solid excrementitious matter.

In the majority of instances, however, the stools are watery, and generally contain a large admixture of mucus. If in this condition of the bowels laxatives are improper, restraining the diarrhœa by astringents is equally injurious, unless the patient become so much exhausted by the frequency of the stools that it becomes a matter of necessity to restrain the purging; but the circumstances in which the employment of astringents becomes requisite, rarely occur.

It is a matter of great doubt to our mind how far this follicular disease, except in its primary stage, can be arrested by any plan of treatment. We are not prepared to deny the possibility of the cicatrization of intestinal ulceration, though we think that when it is extensive, the process of reparation rarely if ever takes place. The indication consequently is, to arrest the primary stage of this disease by local bleeding, and afterwards by a combination of mild mercurial with opium. The mercury is not to be pushed so as to affect the mouth; the evidence of the mercurial action on the gums being all that is necessary. Four grains of the hydrargyrus cum creta may be combined with half a grain of ipecacuanha, or, when the bowels are very irritable, with three grains of the compound ipecacuan powder. Either of these formulæ may be taken every four hours. We have sometimes found, in addition to these remedies, the chalk mixture with laudanum, or an injection containing a drachm of laudanum, at bedtime, attended with good effects.

Dr. J. L. Bardsley of Manchester informs us, that he has been more successful in this follicular affection with a combination of super-acetate of lead and opium than by any other remedy. He recommends three grains of the former with half a grain of the latter every four hours. In some cases he has doubled those proportions with marked advantage. Leeches are to be previously applied to the lower part of the belly, and afterwards blisters, or the tartar-emetic plaster, and the strength supported by wine and other stimulants. This gentleman adds, that in one or two cases in which the patient had recovered from ulceration, but had perished suddenly from some accidental acute disease, on examination after death, not only was the site of the ulcerations most distinct, and their form and size defined, but unequivocal cicatrization had taken place.

Dr. Bright considers the employment of tonic remedies a point requiring nice discrimination. "With regard to the administration of tonic remedies, there is not a doubt that they are of essential importance; and that even while evidence exists of much local mischief in the bowels, it will sometimes be necessary both to support and to stimulate the system: looking indeed to the character of the ulcerations, the deep sloughs which they often form, and the dark red inflammation which surrounds them, there would be reason to suppose that such remedies might be useful: and occasionally the decidedly remittent form which the fever has assumed, has completely removed every scruple, and led to the free exhibition of the sulphate of quinine with admirable effect. At the same time there is more danger to be feared from the early use of stimulants, as long as the system is still able without their aid to support the feeble prostration, than there is risk in abstaining from stimulants a little beyond the period when they might possibly begin to act well. In a general way the system seems capable of supporting itself for a few days under that great degree of prostration which is connected with advanced ulceration of the bowels; and although we cannot determine the exact state of the ulcers in these cases, yet we find that the action of stimulant and tonic remedies is more certainly beneficial after that state of prostration has existed for some time, than when such remedies are administered with a view of obviating or anticipating the first symptoms of collapse: for when administered too soon, they frequently kindle the inflammatory action with redoubled violence, and then it is that the most appalling combination of debility and nervous excitement is seen for one or two days to precede death." (Reports of Medical Cases.)

While we are watching and endeavouring to subdue the intestinal disease, we are not to disregard the complications which arise in the other organs. The brain and nervous system are most likely to suffer from sympathetic disturbance, which is to be moderated by leeching, cold lotions, and blistering the occiput or nape.

The diet of the patient forms a most important part of the treatment in this intestinal affection. The blandest nourishment, consisting of milk and water, or thin arrow-root, is sufficient for the early stage. When the patient becomes exhausted, chicken broth or beef-tea may be added in small quantity to the arrow-root; and should stimulants be required, a little wine may be given according to circumstances.

Treatment of Typhus Fever.—Most physicians who have written on continued fever, though aware of the marked difference between the synochoid and typhoid fevers, have not sufficiently insisted on the modification of treatment which the latter requires. It has been too often imagined, that because the symptoms and the morbid appearances observed in the organs after death are scarcely dissimilar, and that other forms of fever do occasionally pass into typhus, the two diseases are identical. Experience, however, informs us that not only the symptoms and progress, but the effects of remedies, are essentially different.

In the milder cases of typhus fever, bloodletting is seldom necessary, and may in general be dispensed with, unless some special circumstance arise to render it expedient; such as severe pain or sense of weight in the head, flushing, intolerance of light, hot skin, and other symptoms denoting a more intense form of fever. With such symptoms at the commencement, the abstraction of a moderate quantity of blood, especially if the patient be young and of a full habit, will be proper. If, however, the pulse, though rapid, be soft and compressible, the tongue begin early to assume a brown tint, and there be considerable prostration, the loss of blood from the system cannot be sustained.

Should a low form of inflammation in the brain, chest, or abdomen, arise, local bleeding, and afterwards counter-irritation, will be the most judicious mode of treatment. The practitioner must, however, be aware, that symptoms in the progress of the disease may render the expediency of general bloodletting a nice question: for instance, inflammation in some important organ may come on suddenly, and place the patient in urgent danger. The inflammation may be so acute that local bleeding may fail to arrest it; on the other hand, the complexion of the other symptoms and the duration of the fever may seemingly forbid more active measures. If the local disease be allowed to go on, the fate of the individual is inevitable: if, on the other hand, blood be drawn from the system, when either the powers of the patient, or the experience of the prevailing nature of the epidemic, do not warrant the practice, the treatment which the local disease requires may destroy life. The consideration of such a case is most embarrassing, and the result, even under the most skilful management, always doubtful. The rapidity with which the blood flows from the vein, and its appearance when drawn, will often afford assistance. If, instead of pouring in a continued stream, it comes in drops, notwithstanding the vein has been well opened; moreover, when it coagulates slowly, the crassamentum is thin and soft, and the proportion of serum abundant, it shows that the abstraction of blood is a measure of questionable expediency. In short, though bloodletting has been recommended in typhus fever from the early ages of medicine, we find even its warmest advocates acknowledge that it is occasionally productive of harm. Sydenham states, "Quoties mihi cum ægris res est, quorum sanguis vel per se imbecillior existit (ut fere in pueris) vel justa spirituum copia destituitur, ut in decliviore ætate, atque etiam in juvenibus diuturno aliquo morbo confectis, a venesectione manum tempero." Huxham also remarked, "that in cases in which the blood was dark coloured and exceedingly soft, the pulse often sinks surprisingly after a second bleeding, even indeed after the first, and in individuals whose pulse indicated the propriety of a second bleeding."

Sir John Pringle affirmed that many recovered from jail-fever without bloodletting, but very few who had lost much blood; and Dr. Monro confesses that he was often obliged to give cordials to support the strength after bloodletting.

The other measures which have been recommended in mild fever may be adopted in typhus. The shock of an emetic is useful at the beginning, the more so if there be nausea. When the heat of the skin is above the natural standard, cold or tepid sponging is grateful, and allays the morbid heat. Frequent ventilation of the room and changes of linen are also very beneficial.

If the skin be dry, diaphoretics are useful; and should at any time spontaneous diaphoresis come on, it is to be promoted. When copious sweatings appear in the advanced stage of the disease, they should not be interfered with, unless they produce exhaustion, when quinine with diluted sulphuric acid, mild nourishment, and cordials, are to be freely given.

[Perhaps there is no class of therapeutical agents more uncertain than diaphoretics, although they are constantly employed, and, accordingly, observant practitioners have been compelled to express their doubts as to their efficacy in typhus. The main utility of most of them, of the neutral mixture, the solution of acetate of ammonia, &c., as the writer has said elsewhere, (*Practice of Medicine*, 2d edit. ii. 491,) is of a negative character. Something, it is conceived, must be administered, and they are as devoid of objection as most agents that could be prescribed.

Antimonials, as sedatives, on the contra-stimulant plan, have been recommended by Professor Jackson, of Boston, (*Report on Typhoid Fever*, Boston, 1838,) in the typhoid affection: but they have not met with the same favour in the hands of others; and even when antimonials are administered in much smaller doses as diaphoretics, in fever, they have been found to do harm where any decided tendency to irritation of the bowels existed.]

The necessity for purgatives will depend on the condition of the bowels. A mild aperient at the beginning is always proper, to remove any accidental accumulation. The mildest kinds, either castor-oil, rhubarb, or senna, may be prescribed for this purpose, and repeated according to circumstances. When the fever is acute, and the powers are vigorous, the expediency of thoroughly evacuating the bowels, and of abstracting from the mass of circulating fluids through the intestinal exhalents, has been already adverted to. On the other hand, indiscriminate purging is most injurious in any form of fever, but more especially in the typhoid. "I have known," Huxham remarks, "a common purge, injudiciously given at the beginning of this fever, immediately followed by surprising languor, syncope, and a large train of other ill symptoms." Besides, from the greater tendency to inflammation of the mucous membrane and follicles of the intestines in typhus, every source of irritation, and consequently the stimulus of cathartics, should, as much as possible, be avoided.

If these precautions, as to bleeding and purging, are necessary in the early stage, they are more especially so in the advanced; at which period, such aperients as remove unhealthy secretions, without producing watery stools, are to be employed, viz.—rhubarb, magnesia, or castor oil, with occasional doses of mercurials. It is necessary to examine daily the evacuations from the bowels in typhus fever, that the appearance of the stools may be ascertained. Bloody diarrhœa is always a most alarming symptom in fever, showing a malignant form of the disease. It depends on a loaded state of the capillaries of the mucous membrane; these vessels, partaking of the general debility, are unable to resist the congestion or afflux of blood, and consequently give way to its distending force. The congestion of the mucous membrane, and consequent hemorrhage, may take place without ulceration; but when there is ulceration, the blood does not proceed from the open surface, but in the way pointed out, viz.—by capillary exudation. This symptom is best managed by suspending all irritating medicines, and administering occasional doses of superacetate of lead and opium.

When the abdomen is tympanitic, purgatives only increase the distension. Injections of carminatives give most relief, though it is only temporary. We have found an injection, consisting of equal parts of the mistura assafœtida and gruel very beneficial. As the disease proceeds, it will be necessary to allow, according to circumstances, moderate support—weak animal broths, and perhaps a little wine.

We must admit, that in the treatment of fever, wine is too often administered without due consideration of the character of the disease, its stage, and the condition of the several organs. Dr. Wilson Philip observes, "that the difference of opinion which prevails on this subject has, in a great degree, arisen from physicians having attempted to apply their rules, either for or against it, to all cases indiscriminately. Whereas it would appear that the use of wine in typhus must be almost as much regulated by circumstances as that of bloodletting in synocha. Two general observations, however, appear to me to be warranted, that more or less wine is beneficial in all severe cases of typhus; and that there are few in which large quantities are not injurious." When we see a patient labouring under symptoms of extreme debility, and find them almost uniformly relieved by a large quantity of wine, it is difficult at first view to persuade ourselves that it can be pernicious.—But an attentive observer will look beyond its immediate effects, and will often see sufficient reason to doubt the safety of carrying the practice very far. He will find that the temporary excitement he thus procures, is frequently succeeded by a greater degree of debility than that which the stimulus had removed; and if he perseveres in the practice under such circumstances, the pulse, upon the whole, will gradually become more frequent and feeble, till it ceases altogether.

Wine is seldom necessary in the early stages of fever, nor, as a general rule, at any period of the acute forms, unless, as occasionally happens, unexpected exhaustion come on, or towards the decline of the disease the powers give way. Under these circumstances, a few ounces of wine, if the skin be cool, the pulse soft, and the tongue moist, will frequently improve the condition of the patient.

In determining the propriety of administering wine in fever, the decision may in some measure be regulated by the character of the disease. We have repeatedly alluded to the difference in the type of epidemic fever. This, in our own experience, has been remarkably illustrated in the epidemic constitution of the last three years. In 1829, fever required most decided antiphlogistic treatment, as the records of the London Fever Hospital will prove. In 1830 and 1831, the symptoms assuming a low typhoid form, (which has continued up to the present time,) a more cordial or stimulant treatment became necessary. This shows that the general character of epidemic fever may at times be such as to require a stimulant plan of treatment.

Besides the indications for the administration of wine, deduced from the nature of particular epidemics, there are some special symptoms which render its exhibition necessary.

1. It is sometimes observed, that when a patient in fever has been going on favourably, the pulse becomes suddenly soft and compressible, the skin cool and damp, accompanied with feeling of considerable exhaustion, and desire for wine. With these symptoms, there need be little hesitation in allowing six or eight ounces of wine in the twenty-four hours, at proper intervals.

2. When the symptoms denoting sensorial disturbance,—languor, low muttering delirium, coma, muscular tremor or subsultus, progressively increase; if, at the same time, the patient lose his strength from day to day, the pulse be soft, and the skin cool, wine may be safely prescribed.

3. When the fever assumes the petechial character, more especially if the spots be large and of a dark red or livid colour, wine is indicated.

4. In cases of sudden or unexpected collapse, which sometimes comes on without ostensible cause, though more frequently after bloodletting, protracted diarrhœa, or spontaneous hemorrhage, wine is a most effectual remedy in raising the exhausted powers of the patient.

5. Wine may be necessary to promote the convalescence in particular cases.

Another circumstance with regard to the employment of wine in fever requires to be noticed. Local inflammations not unfrequently arise in feeble habits, or in the advanced stage of low fever, requiring general or local bloodletting. The treatment necessary to subdue the local disease lowers the general strength: the patient does not rally, but remains stationary, and perhaps loses ground and feels exhausted. In such cases, a moderate quantity of wine, provided the pulse be soft and the skin cool, is followed by excellent effects. We have often been obliged to prescribe the local and even general abstraction of blood for some sudden emergency, and in a few hours afterwards found it necessary to have recourse to the administration of wine. In such cases it should be withdrawn as soon as the powers have been restored.

Dr. Graves is of opinion that when general symptoms indicate the propriety of administering wine and opium in fever, these remedies should be prescribed, although particular symptoms apparently render the propriety of their exhibition doubtful. Dr. Graves thinks advantage may often be derived from wine and opium at an advanced period of fever, when the tongue is coated with dry brown fur, and the teeth and gums covered with sordes—when there is suffusion of the eyes,—dry hot skin, heat of the scalp and flushing—a low form of delirium, with muscular tremor and subsultus—sense of weight or pain in the head, not of the acute throbbing character—and rapid, soft, or small thrilling pulse.

When the symptoms alluded to by Dr. Graves are manifest at the advanced stage of fever, we apprehend they arise from some latent local disease which has not been overcome, or has been partially renewed, and requires the adoption of local remedies suited to its intensity and the powers of the patient. We have admitted that a general stimulus, such as wine, is by no means incompatible with the local measures which are necessary to subdue low typhoid inflammation; and in offering these precautions we feel we are corroborating the opinion expressed by Dr. Graves on this subject. His remarks, indeed, are accompanied with such precautions, as show he is aware of the necessity of guarding the inexperienced practitioner against the indiscriminate exhibition of wine and opium in fever. (Dublin Journal of Medical and Chemical Science, No. 3.)

With respect to the quantity and mode of administering wine in fever, it may be remarked that it is impossible to give any general rule on this subject. The quantity must be regulated by its effects. Some of the older authors prescribed wine apparently without regard to quantity; we find on record cases of typhus fever, in which two and three bottles of madeira or port have been allowed in twenty-four hours. It would appear from these histories, that in certain forms of low fever, the system is nearly insensible to the effects of stimulants. Incredible quantities of wine have been taken by persons unaccustomed to wine without any signs of intoxication, or any other perceptible effect except that of increasing the volume of the pulse, abating the delirium and muscular tremor, and restoring the heat of skin.

In the present day, physicians seem less disposed to sanction extravagant doses of wine. Dr. Bateman was not inclined to exceed a pint in twenty-four hours; and enjoined, that after the object with which it is administered has been obtained, this quantity should be diminished or withdrawn, when the first symptoms of over-excitement appeared. The quantity should not be less than four, nor exceed sixteen ounces, in the twenty-four hours, unless under circumstances of sudden and extreme exhaustion, when a larger quantity may become necessary. It should always be given in small quantities, (from half-an-ounce to an ounce,) mixed with water, or some light farinaceous food, arrow-root, sago, or thin panado, the period between each dose varying according to the allowance. It is better to commence with a small quantity, and as the fever advances, or the debility increases, to augment it cautiously, and to watch its effects.

It is necessary also to bear in mind, that the quantity of wine should be regulated by the age and constitution of the individual. Young persons are not only more easily excited than those advanced in years, but in the latter the symptoms requiring the use of wine more frequently occur, and increase more rapidly.

The previous habits of the individual must also be considered; if he have been accustomed to live generously, and consequently to the use of wine and other stimulants, the allowance of wine must be greater, than in a person whose mode of living is more simple.

If we find that the pulse is quickly raised, the heat of skin increased, and the face becomes flushed, and the patient restless or incoherent, we may consider the quantity is either too large, or that the use of wine is improper. Again, if its effects soon pass off; if the patient, a short time after being stimulated, lapse into his former state of exhaustion, or seem to get weaker after each portion of wine, its longer continuance will be of little avail. On the other hand when there is a gradual and steady improvement in the symptoms, without any marked excitement after the wine has been taken; moreover if the patient relish the wine, and especially if it tranquillize him, we may confidently anticipate that it will be beneficial.

When the purposes for which wine has been given have been accomplished, it should be gradually, not suddenly, withdrawn, and the patient watched; as we have not unfrequently witnessed the train of symptoms, for which wine was first administered, renewed shortly after it has been discontinued.

The particular kind of wine is a matter of less consequence than the quality of that selected. We generally prefer the dry wines; sherry or sound Madeira, which are less likely to disagree than the red wines.

[Dr. Stokes (*Dublin Journ. of Med. Science*, Mar. 1839, reprinted in the *Amer. Med. Library*, Philad. 1840) has endeavoured to deduce from the state of the heart an additional rule of guidance to the inexperienced in the administration of wine in typhus. Two opposite conditions of the organ may be observed in the disease—in the one, the impulse becomes extremely feeble or altogether wanting, whilst the sounds are greatly diminished in intensity: in the other, the impulse and sounds continue vigorous through the whole course of the disease. These opposite states are not necessarily revealed by the condition of the pulse or the warmth of the surface. We may observe a hot skin, whilst the action of the heart is almost imperceptible; and, on the other hand, a patient may be pulseless, cold and livid for days together, whilst the heart is acting with the greatest vigour. This condition of the heart has to be determined by auscultation over the infra-mammary and sternal regions—the pulse being an uncertain guide. These physical signs are considered by Dr. Stokes to indicate a debilitated condition of the heart, which may even occur at an early period of the disease, and thus enable the practitioner to anticipate the symptoms of general debility; and he infers from his observations, that their presence, in a case of spotted adynamic fever, may be considered to point out a softened state of the heart;—that this softening is one of the secondary lesions of typhus,—and that the diminution or cessation of impulse, the proportionate diminution of both sounds, or the preponderance of the second sound, are direct and nearly certain indications for the use of wine in fever.]

Brandy, largely diluted, is sometimes given in preference to wine. Brandy being about double the strength of wine, when it is prescribed as a substitute, one-half the quantity stated may be ordered.

Fermented liquors are sometimes given in fever, and when a more mild stimulus than wine or brandy is wished, they are well adapted to the purpose, particularly when bottled.

Yeast has been employed in fever accompanied with putrescent symptoms, when the existence of inflammatory complications seems to contra-indicate stronger stimuli.

In some cases of extreme prostration, yeast has been given in combination with wine and other cordials. Dr. Stoker, who seems to have used it more extensively than any other physician of the present day, speaks highly of its efficacy, after a trial of its powers for upwards of thirty years, both in public and private practice. He had administered it in cases where purple extremities or gangrenous sloughing took place, accompanied with symptoms of inflammation. The result of his experience is, that barm or yeast is well suited to every stage of typhus fever in which it can be borne by the stomach. It is in general easily taken alone, or with any medicine that it may be deemed advisable to join with it; but, in the worst forms of typhus fever, when it is most needed, it not only is seldom rejected by the stomach, when any other medicine can be retained, but the patient, in such cases, often expresses a liking for it. According to this author, yeast, being moderately laxative, often supersedes the necessity of repeated doses of purgatives; but, if required, an aperient tincture may be added to it. Should, however, the bowels be purged, a few drops of tincture of opium should be added to each dose. He ascribes its efficacy to its power of correcting the morbid contents of the alimentary canal, and consequently the symptoms of putrescence, and asserts that, in his idea, petechiæ and black loaded tongue will be found more effectually remedied by it than by any other medicine. In adverting to the objection to this remedy, that it may be likely, by promoting fermentation, to increase the tendency to tympanitic distension, Dr. Stoker states, that in some of the most obstinate cases of tympanitis, enemata of yeast and assafœtida have proved the most efficacious remedies.

When yeast is administered internally, two table-spoonsful may be given in water, or with an equal quantity of camphor mixture, every three hours. If the stomach be irritable, four ounces mixed with an equal quantity of barley gruel may be administered by injection. From our personal experience of yeast, we certainly think it a remedy deserving attention in the low forms of fever.

Various other stimulants have been occasionally prescribed, alone or in conjunction with wine, in typhus. The carbonate of ammonia, combined with nitrous ether and aromatic confection, has been thought useful. We have certainly observed, that in cases in which a sudden and diffusible stimulus, less permanent in its operation than wine or brandy, has been indicated, this combina tion has answered the purpose. We have seen it useful also as an expectorant in the symptomatic bronchitis of fever.

Another class of stimulants of a less diffusible character has been employed in the treatment of fever, viz. tonics. Of these, the vegetable tonics have been chiefly employed, more especially the cinchona or Peruvian bark, which, after sustaining more varied reputation than any other remedy in the Materia Medica, was at length admitted to possess superior febrifuge powers to any drug which has been discovered. When first introduced, it was prescribed chiefly in periodic fevers, but soon after acquired equal reputation in the treatment of continued fever. Its indiscriminate administration, however, without regard to symptoms or the period of the disease, has tended to diminish the confidence formerly reposed in its virtues. In the present day it is scarcely employed in the acute forms of fever, unless some particular symptoms arise, or when the fever towards its decline assumes the typhoid character.

Dr. Cullen remarks, that wherever bloodletting is proper in continued fever, bark is always prejudicial. The opinion of Dr. Bateman on this point is exceedingly strong. He states that, in the early part of his practice, agreeably to the doctrine of the times, he resorted to the decoction of cinchona on the first appearance of languor and debility. The increase of the symptoms was easily imputed to the intractable nature of the disease, or deemed the necessary result of its progress, until it became obvious, from the repeated occurrence of the fact, that the tongue, which had been, on the day before the administration of the bark, moist, and exhibiting a moist or yellowish mucous fur, was on the following morning dry or even brown; that the skin was hotter or more parched, with a flush in the cheek; that the pulse was quicker and harder; the thirst increased, and the sleep more disturbed. Dr. Bateman was so convinced that these symptoms were to be ascribed to the use of bark, notwithstanding the patient had made some progress towards recovery, that he scarcely ever prescribed it even during the stage of convalescence.

Our own experience is, that in the early stage of common epidemic fever, any preparation of bark is decidedly injurious. When the symptoms of fever have completely subsided, no tonic or stimulating remedy is needed, unless the patient be much enfeebled, and the strength slowly recovered. In such cases tonics are sometimes useful, and certainly none of the vegetable class is more powerful than bark in the form of the quinine. But we hold its exhibition in the early stages of fever under any circumstances improper, as tending, by its stimulant powers, to keep up or increase the febrile action in the system; and when there is loca' complication, it is evidently so pernicious that scarcely any practitioner can be so ignorant of the common principles on which the treatment of fever should be conducted, as to think for one moment of its administration under such circumstances.

When the fever is of the typhoid form, and the symptoms, as the disease advances, denote failure of the powers, more particularly if the pulse become soft and compressible, the skin covered with petechiæ, and there be tendency to gangrene, bark, in addition to nourishment, wine, and other stimulants, may be given with the best effects. The sulphate of quinine combined with sulphuric acid is the best mode of administration.

[In the typhoid affection, occurring in children, MM. Barthez and Rilliet (*Archiv. de Méd.* 1841; and *Traité Clinique et Pratique des Maladies des Enfants*, ii. 413, Paris, 1843) are somewhat favourable to the use of sulphate of quinia.]

Infusions of some of the other vegetable tonics, serpentaria, cascarilla, calumba, &c., have been proposed as substitutes for the cinchona. As stimulants they are less powerful, and when a light vegetable tonic is desirable, the infusion of any of these may be advantageously prescribed, with or without the addition of an aperient, according to the state of the bowels.

Opium and other narcotic substances have been administered in fever with two indications: 1st, as stimulants when the powers are sinking; 2d, to tranquillize the nervous system, and to procure sleep. The use of opium, as a general stimulant in fever, has been abandoned, wine being proved more safe and durable in its effects.

From the stimulant effects of opium, it is injurious in the acute forms of fever, more especially when local inflammation exists. In the early stages it is inadmissible, and indeed much discrimination is required to detect the symptoms which indicate its administration. The delirium and wakefulness of sub-acute inflammation of the brain is best overcome by topical bleeding, and the application of cold lotions to the scalp; and when the morbid condition of the brain on which the want of sleep depends is removed, the patient generally enjoys intervals of refreshing sleep. In other cases, a state of distressing restlessness with obstinate wakefulness remains, exhausting the patient, and adding greatly to the sufferings. If, with these symptoms, the pulse though soft be rapid, the skin cool, the face pale, the tongue moist, and there be no suffusion of the eyes, opium often acts like a charm. If, however, its exhibition be followed by increase of delirium, thirst, and heat of skin, or if the tongue become dry, and the bowels confined, it should be discontinued.

We do not however think, that in every case the opium should be withheld, if the tongue be dry and even furred, as we have often seen this remedy decidedly beneficial when the tongue was in this state, if the other symptoms indicated its exhibition.

Dr. Stokes has proposed the administration of large doses of opium in peritonitis from intestinal perforation. In these cases the usual antiphlogistic treatment is inadmissible, from the sinking of the vital powers, which rapidly supervenes. When effusion of the alimentary contents through the perforation takes place, the fatal issue is inevitable. In some few instances, nature, as we have already observed, makes an attempt to repair this lesion; adhesion of the bowel, at the point of perforation, to some portion of the intestine, or adjacent viscus, is sometimes formed, and thus effusion into the abdomen is prevented. When this occurs, the peritonitis is limited in extent; and to these cases the administration of opium is well adapted. Dr. Stokes states, that in the treatment, the first indication is to support the strength of the patient, as far as this can be done without injury; the second, to prevent the further effusion in the peritoneal cavity, by endeavouring to induce organization and adhesions of the effused lymph. This latter indication is best fulfilled by time, and by attempting to diminish as far as possible the peristaltic motion of the intestines. For this purpose opium is to be given in repeated doses. Solid opium, in grain doses, or the black drop in doses of five drops, is recommended to be given every second hour till the symptoms of abdominal inflammation abate, after which the dose is to be given at more distant intervals. In one case, though unsuccessful, this treatment afforded decided relief. Sixty drops of the black drop were given in the twenty-four hours. In another, in which recovery took place, one hundred and five grains of solid opium (exclusive of anodyne injections) were administered without the patient experiencing any of the usual effects of this remedy when exhibited in large doses. (Dublin Journal of Medical and Chemical Science, May 1832.)

We think this suggestion of Dr. Stokes valuable, even in those cases in which the fatal issue is inevitable, in consequence of rapid and extensive peritonitis from effusion of the contents of the bowels into the abdominal cavity; it is the best palliative mode of treatment; and in partial peritonitis, when nature attempts the reparative process, it gives the patient the best chance of recovery.

The form in which opium is prescribed is a matter of less moment than a correct knowledge of the circumstances which indicate or forbid its employment. We have found a full dose of solid opium, (one or two grains,) answer every purpose. But we certainly prefer the acetate or the muriate of morphia, in doses of half a grain dissolved in distilled water. Some physicians prefer minute doses of opium at certain intervals, so as to keep the nervous system under its influence. We have tried this mode, but deem it less efficacious than a full dose administered at once.

[Opium is certainly a most valuable agent in many cases of typhus fever, and is rarely found to prove injurious, notwithstanding the cautions inculcated by many writers in regard to it, who appear to have been led rather by hypothetical considerations than by the results of experience.]

The other narcotics—hyoscyamus—camphor—cicuta, are very inferior in efficacy to opium. They may, however, sometimes be advantageously combined. The extract of poppy, in doses of eight or ten grains, is often a pleasant opiate. We have also found fifteen or twenty grains of camphor, combined with a quarter of a grain of acetate of morphia, an excellent formula.

[In protracted cases of typhus in which there is general debility with or without manifestations of encephalic hyperæmia, subsultus, watchfulness, muttering, delirium ferox, or even convulsions, Dr. Graves (*System of Clinical Medicine*, Dublin, 1843) praises most inordinately a combination of tartrate of antimony and potassa with opium, the discovery of the utility of which he claims to be "peculiarly his own." The circumstances, under which the combination is applicable, are, according to him, exactly those which would formerly have been believed to demand the fresh application of leeches to the head, cold lotions and blisters. The combination is prepared as follows: *Antim. et Potass. Tart.* gr. iv.; *Tinct. Opii*, f.ʒj; *Aq. Camphor.* f.℥viij. M. Dose, f.ʒij to f.℥ss every two hours.]

The practice of applying blisters in fever was adopted by the older authors to produce a stimulating effect in the advanced or sinking stage of the disease. There can be little question of the effect of rubefacients and vesicants in exciting the system in phlogistic states, but we apprehend their efficacy in rousing the vital powers when the nervous system is oppressed is very questionable, and that, consequently, their value as general stimulants is doubtful.

Blisters and rubefacients are, however, applications of great utility in the local inflammations which occur in fever. They may be employed with this view as auxiliaries to other antiphlogistic measures; or in cases when the vital powers are so low that even local bloodletting cannot be adopted, they may be applied at once, as near the inflamed organ as possible, with the best effects.

Blisters are not, however, to be prescribed without discrimination, as injurious consequences often arise from their injudicious application.

In the acute forms of fever with local inflammation, they should never be employed till more active measures have been adopted. When the capillary congestion has been reduced by local or, if necessary, general bloodletting, should pain or any other symptom indicate that the local affection has not been wholly subdued, the application of a blister to the neighbourhood of the inflamed organ will often remove the disease. If it be applied without this precaution, it will invariably increase the very action it was intended to subdue. Even with the circumspection recommended, we have repeatedly seen the local disease renewed by the stimulus of a blister. It is, therefore, by no means always safe to adopt counter-irritation in the more acute forms of fever, notwithstanding the too common practice of at once applying blisters on the first appearance of local inflammation, without the precaution of previous depletion.

In the inflammations which arise in typhoid fevers, blisters are excellent local remedies, and we certainly think they are more useful in this than in any other form of the disease. In the low kind of cerebral inflammation, with tendency to coma, after leeching, the application of a blister to the occiput, with a cold lotion to the anterior portion of the scalp, is followed by the best effects. Some physicians think that in these cases a sinapism or a blister to the lower extremities is of great service, and explain the efficacy of these applications on the principle of revulsion. We have certainly seen excellent effects result from them.

Cases are recorded in which boiling water has been applied to the extremities with the object of producing sudden and powerful revulsion in severe cerebral affection in fever. In extreme cases this may be adopted, but from the severity of the measure it can never be generally pursued.

In the secondary pulmonary affections which frequently arise during fever, local bleeding by leeches or cupping, and afterwards blistering the chest, is the best mode of treatment. When the symptoms have been overlooked on their first appearance, or when the strength will not admit of any form of bloodletting, counter-irritation is the only local treatment that can be employed.

In the chronic state of the intestinal disease to which we have so often adverted, blistering the abdomen is decidedly beneficial. This practice is however by no means applicable to the acute stage of gastro-enteritis; indeed the application of a stimulus so powerful would inevitably increase the inflammatory action.

It is necessary to bear in mind, that in the typhoid forms of fever blisters do not always heal kindly. The blistered surface, assuming an unhealthy aspect, gradually degenerates into a troublesome species of ulceration, which keeps up feverish irritation in the system. When blisters either do not rise at all, or become troublesome ulcers, it is always an indication of a dangerous fever. We have certainly seen the fatal issue hastened by the effects of a blister.

With regard to the milder forms of counter-irritation, we have seen, in slight cases of local disease, sinapisms very useful. The epigastric tenderness with irritation of the stomach which occasionally appears in the early stage of fever, is often at once removed by the application of a mustard poultice to the epigastrium.

In the gastro-enteritis of fever, cloths soaked in oil of turpentine, and kept constantly on the abdomen, have been applied in order to produce counter-irritation and revulsion. When circumstances prevent the use of blisters, this application may be substituted, though it is much less powerful than either mustard or cantharides.

In all cases of fever, more especially with cerebral affection, it is exceedingly important to examine the state of the bladder. When there is retention of urine, the catheter should be employed. The practitioner requires also to be vigilant when the urine is passed involuntarily; in these instances, from the paralysed state of the muscles concerned in the expulsion of urine, the bladder becomes distended, its muscular coat ceases to contract on its contents, and from a small quantity being occasionally voided involuntarily, the medical attendant is apt to be satisfied with the report of the nurse, that there is no accumulation in the bladder. The tympanitic enlargement of the abdomen may prevent the distended bladder being felt, so that in these cases the catheter should be occasionally introduced to ascertain the state of this organ.

We have already alluded to the revival of the theory, that a vitiated state of the blood is the cause of some forms of fever.

A mode of treatment founded on this view has been proposed by Dr. Stevens, on the supposition, that in fever, but more particularly in the malignant forms, the vitality of the blood is lessened, and the quantity of its saline ingredients, especially the muriate of soda, ultimately diminished. He considers that the natural saline impregnation of the blood is the cause of its red colour, and that the diminution of its salts is the reason of its black and vapid condition in the last stage of fever.

On this theory, Dr. Stevens recommends, after reducing excitement at the commencement by bleeding, purgatives, and other antiphlogistic measures to prevent serious injury to any of the organs, the administration of a sufficient quantity of non-purgative salts, with the object of restoring to the blood the proportion of saline ingredients it has lost. After this has been done, in place of lessening the quantity, it is necessary to remedy the diseased quality of the blood, by correcting acidity, if it be present, by alkaline carbonates, and afterwards throwing into the circulation an extra supply of those stronger salts which act directly on the blood, reddening its colour, correcting its diseased properties, and adding to its power of stimulating the heart.

For a considerable time after Dr. Stevens commenced the saline treatment, he used (except when there were symptoms of acidity in the stomach) a strong solution of the muriate of soda with nitrate of potash; but he has subsequently preferred another combination, consisting of twenty grains of the muriate of soda, thirty grains of the carbonate of soda, and eight grains of the chlorate of potass. This saline powder, dissolved in water, is to be given every two or three hours (more or less frequently, according to circumstances) in the middle and last stages of fever, and to be gradually left off as the convalescence advances. These salts enter the circulation and do not irritate the stomach and bowels; and according to Dr. Stevens, when given before the stomach has ceased to perform its functions, the bad symptoms soon disappear. A solution of the muriate of soda (two table-spoonfuls to a pint and a half of tepid water or thin gruel) may also be occasionally thrown into the bowels. The strength is at the same time to be supported by strong clear beef-tea.

In extreme cases, or when the practitioner is not called in till the very last stage of fever, Dr. Stevens thinks life may be occasionally saved by injecting a saline solution into the veins.

We have lately adopted this saline treatment in some cases of typhus fever. Our individual experience, however, has been so limited that we are scarcely competent to pronounce an opinion on its value. If the premises advanced by Dr. Stevens be correct, (and we have already expressed our belief that a certain class of fevers do originate in a morbid state of the blood,) the saline treatment he has had the merit of proposing, appears the most likely to correct the vitiated condition of the blood. It should also be observed that Dr. Stevens does not overlook the changes in the solids: when these exist, they are to be treated by active measures, and the saline treatment afterwards adopted.

It would appear, also, that the nitrate of potash, which has been long used as a cooling remedy in fever, may act beneficially on another principle—that of altering the diseased properties of the blood.

It is well known that this salt, when mixed with dark blood out of the body, possesses the power of instantly changing the colour to a bright red; and from its having been used with the most beneficial effects in cases of scurvy, it is reasonable to suppose that it will effect a beneficial change in the blood in malignant fever.

It is proper to add a few observations on the diet of fever patients. The complete disrelish of every kind of food during fever points out the necessity of abstinence; and in cases where, from mistaken views of the supposed advantage of nourishment, food of an improper description is given, the stomach frequently rejects it.

For the first few days the patient generally refuses any kind of food. While the febrile symptoms continue, farinaceous substances, such as the different kinds of gruel—arrow-root, sago, rice, prepared barley, and oatmeal, acidulated with lemon-juice; form the most suitable nourishment. A cup of any of these gruels may be given at intervals, and if the patient retain the relish for it, a cup of weak black tea may also be allowed occasionally. We have often observed that thirst is more effectually allayed by weak tea than by any other beverage. Sometimes ripe fruits are grateful, and therefore may be allowed in great moderation, unless there be symptoms of gastric disorder, or such fruits disagree.

When the symptoms of fever abate, more particularly when the tongue begins to clean, and the appetite to improve, a portion of stale bread or water biscuit should constitute the only additional nourishment, till the fever has entirely disappeared. The weak animal broths may then be substituted for the farinaceous food; and of these the quantity should at first be moderate, that the stomach may not be oppressed.

In the course of three or four days a little solid animal food, plainly dressed, may be allowed, unless there be special circumstances to forbid it. The quantity of animal food should not exceed three ounces at first, and mutton, from its being more easily digested, should be preferred. If the patient feel any uneasiness after it has been taken, it must of course be omitted, and beef-tea or mutton-broth again for a time substituted.

When the patient has been much reduced, more particularly if there be a natural delicacy of habit, one or two glasses of sherry wine, mixed with water, may be taken during the day; but, in general, in convalescence from common epidemic fever, wine or fermented liquors are not required, unless the powers are feeble, or the patient has been accustomed to their daily use. As a general rule, nourishment may be given more early in typhus than in the acute forms of fever.

Of Convalescence.—In no form of acute disease is the management of convalescence of more importance than in continued fever; and few persons among the educated—none among the ignorant—can conceive the precision that is required in this particular.

It is too commonly imagined that, when the fever has disappeared, all danger is at an end; that nothing remains to be done but to recruit the strength by nourishing food and imprudent exertion. If the feeble state of every organ in the body, but more especially of those which may have been more seriously affected, and the slow and gradual manner in which they recover their natural vigour, were considered, few would be so careless of their safety as to hazard a relapse which might be fatal.

It is the duty of medical attendants to place these circumstances strongly before the patient, and to impress on the mind the paramount necessity of refraining from every thing that is likely to produce excitement.

In almost every case the practitioner has to contend against the prevailing notion, that the strength can only be restored by nourishment, and even wine. The inherent restorative powers of the system, and the greater safety of leaving nature slowly to effect her own purposes, than to hazard a renewal of the febrile action, or to rekindle local inflammation by acts of imprudence, should be pointed out. When the symptoms have been severe, and consequently the treatment active, more especially when large losses of blood have been sustained, the greater is the danger of relapse. In some instances again, the local inflammation which may have arisen has not been wholly extinguished, there is a lurking indisposition—a tedious recovery, as it is termed. Such cases, it should be remembered, only require the excitement resulting from indiscretion in diet or prolonged exertion, to reproduce the local inflammation.

In the management of convalescence, therefore, the patient should not be permitted to sit out of bed till the strength be considerably advanced. It is better that restriction should be imposed a little too long, than that any risk of relapse should be run.

The next point is of still greater consequence—the proper regulation of the diet. This has been already minutely discussed, as well as the order in which the food should be changed. We may, however, remark that, in our experience, by far the greater number of cases of relapse take place from indiscretion in diet. It should also be strongly impressed on the convalescent, that it is as necessary to guard against the quantity as the quality of food, particularly when there has been gastric irritation in the progress of the fever. The stomach may be able to digest and assimilate a limited proportion of food; but the indulgence of an extra ounce or two may induce oppression, and a renewal of the fever. This organ in convalescence partakes of the external or muscular debility, and the convalescent may as well expect to be able to carry a heavy load on his shoulders, as to digest an undue quantity of food, even of a suitable kind. Indeed, every practitioner of experience knows, that with the best precautions, the return to solid animal food is hazardous.

Besides avoiding every source of general excitement, it is necessary to impose restrictions according as the several organs may have been affected. Thus, when the symptoms in the brain have been severe, undue mental effort should at first be abstained from as much as possible. When the lungs have been inflamed, every circumstance likely to produce recurrence of the pulmonary disease must be avoided; and similar precautions, but more especially with regard to diet, are necessary when the gastric organs have been implicated.

Exposure to cold in the winter and spring must be most attentively guarded against. Many persons who have struggled through a most dangerous fever, have, from imprudent exposure to cold, been seized with intense inflammation in some organ, which has rapidly destroyed life: hence the necessity of suitable clothing, and regulating the temperature of the chamber, during the period of convalescence from fever.

A. Tweedie.

FEVER, EPIDEMIC GASTRIC.—The arrangement of febrile diseases by Sydenham was founded on the observation that such diseases, revolving in cycles, present characters which are probably owing to certain changes in the constitution of the inhabitants of a country, whether produced by the nature of seasons, or of exhalations from the ground, or of food, or by moral causes, or by a combination of all these important influences. These influences, although they act in a manner hitherto unexplained, give a stamp to epidemics; and not only do they affect the epidemic, the great current disease, but also those concurrent diseases which specifically differ from it, while they retain towards it a certain generic affinity. Hence it is that we have considered a passage in Sydenham, which has often been quoted, as the best clue to guide the physician who means to explore the labyrinth of febrile diseases; a passage which, had it stood as a solitary fragment, would have vindicated the claim of Sydenham to be considered a master in the science which he cultivated. So admirable is it, that in letters of gold it ought to be inscribed in the consulting-room of every fever hospital in the empire, to guard physicians against the evils which flow from adopting the exclusive views of systematic writers, or following the dangerous routine of practice to which they often lead. "This, however, I am convinced of from numerous careful observations, that the same method which cures in the middle of the year may possibly prove destructive at the conclusion of it; and when I had once happily fallen upon a genuine method of treating any species of fever suitably to its nature, I always proved successful (proper regard being had to the constitution, age, and other particular circumstances of the patient,) till that species became extinct, and a new one arose, when I was again doubtful how to proceed, and notwithstanding the utmost caution could scarce ever preserve my first patients from danger till I had thoroughly investigated the nature of the distemper, and then I proceeded in a direct and safer way to the cure."

Three times in the course of thirty years, gastric fever, or rather gastro-enteric fever, has prevailed under our observation; first, about the latter end of the last century or beginning of the present, in 1799 or 1800; again in 1816, and a third time in 1826–27. With respect to the duration of its first visit, we cannot speak with certainty; in 1816 it did not continue for many months; but the epidemic which arose in 1826–27 is not yet over: and thus it has afforded to the medical observer an opportunity of deliberately inquiring into its character and tendencies. It is chiefly from this epidemic that the following history of the disease is drawn up.

The following may be considered as the most remarkable features of gastric fever. General uneasiness and restlessness, or as the patient is apt to describe his condition, "complete wretchedness;" a most unpleasant state of the mouth—a taste which, like the general unhappiness, cannot be described, but is intolerable; heat, often tenderness, or even pain in the epigastrium, and redness of the fauces, which often ends in an aphthous state of that surface.

This species of fever often begins in an unusual manner, and also follows an unusual course. Many patients have fallen under our notice who had been indisposed for a considerable length of time before the formal invasion of the disease; from one to five weeks: they had complained of occasional headach, languor, and irregularity of the bowels; their tongue being white, their stomach flatulent, the eructations fetid; yet were they not without appetite, nor were they by disease incapacitated for business, nor unable to take exercise, although it soon produced exhaustion. Seldom can the day upon which the fever commenced be ascertained, and generally there is no regular crisis; in short, both the attack and the recession of the disease are almost insensible, the former especially often occurring without the consciousness of the patient or the observation of his friends.

Many patients also continue for a long time unconscious of their true state, and are astounded when they learn that they are under the influence of continued fever. During the years 1828 and 1829 the writer has often found in his study, waiting his return home, a patient who was under an impression that he had contracted some slight disorder of the stomach or biliary organs, but who in reality laboured under gastric fever, and had done so for many days, or perhaps weeks. In these individuals the tongue was generally white, while there was a blush of inflammation in the fauces; they complained of an unpleasant taste, and a degree of thirst: their pulse was from fifteen to thirty beats quicker than natural, and there existed some heat of skin. They admitted that they felt uneasiness in the abdomen, and they complained of restless nights, during which their thoughts were often confused and incoherent, and yet their muscular strength was not much impaired; and hence it was not surprising that they should have expressed no small astonishment when the nature of their illness, with the necessity of confinement to the house, was explained to them. Some were affected with headach, which completely intermitted in the morning, and was severe towards night; and this had been the case for many days before a rigor, which often introduced a state of aggravated suffering, took place. An apothecary of discrimination, explaining the case of a patient who for several weeks had been ill, added that he had been "affected with one of those walking fevers," by which he meant that he had walked about performing his business, while affected with gastric fever.

The tongue in some cases is not loaded; nay, on a cursory examination, one would often be tempted to say that the tongue was quite natural in appearance; for, although the papillæ were elongated, and the intervals between them rather glassy, it was not white, and there was scarcely any coating on it. But in other cases the tongue is covered with a thick cream-coloured secretion, like size laid on with a brush, and so also are the fauces. This, which resembles the thrush of infants, is one of the most characteristic symptoms of the disease. We once conceived that the appearance in the fauces was caused by exfoliation of the epidermis of the mucous coat, but it is not so; for when the crust is spontaneously detached or removed by a borax gargle, or rubbed off by means of lint at the end of a probe, the surface beneath, although vascular, is not excoriated. Sometimes the coating on the tongue is dry and brown, and sometimes the centre of the tongue appears as if covered with silver paper, the edges being moist. In the advanced stages of the severe cases it is often rough, dry, shrivelled; sometimes it seems as if covered with varnish, and cleft, especially by a central line, these ragades being deep and painful, and leaving permanent furrows.

There is very generally an affection of the stomach, which varies much in severity; so slight is it in some cases that the appetite for food is scarcely impaired, while in others symptoms of intense gastritis are observed: nor is there any want of intermediate cases of every degree. Generally accompanying the very disagreeable taste already alluded to, there exists nausea and a loose state of the bowels; the stools being watery, of a light brownish yellow colour, and of a pungent odour, not unlike the odour which sometimes exhales from the discharges which take place during dysentery, or like the smell of the steam which arises when *corned* meat tending to putrescency is boiling: these stools are not unfrequently mixed with mucus. Sometimes large discharges of blood from the intestines take place, which generally are followed by a mitigation of all the symptoms of the disease, the blood being generally fetid and dark, almost as dark and much more fetid than the discharges in melæna. After such discharges, however, the patient will often sink and die. The urine is mostly high-coloured: great thirst usually exists. In a protracted case of gastric fever, a patient attended by the writer drank fifty dozens of soda water. Considerable heat of surface exists, especially towards evening. The pulse varies; its most usual property is hardness: often it will for a great many weeks exceed 120, while in many cases it never exceeds 80: even then the other symptoms are alarming; as, for instance, when the stools and urine are passed involuntarily. Sometimes the disease ends fatally without any tenderness, pain or inflation of the abdomen: but frequently as the disease advances, the intestines become distended with flatus, and tympany occurs, which in this disease is a more alarming symptom than it is in most other febrile disorders. And sometimes also in its advanced stages, this variety of fever is attended with stupor, low muttering delirium, hiccup, subsultus tendinum, floccitation: in short, with all those symptoms, bootless to enumerate, which attend typhoid fevers. Moreover the fever is often attended with bronchitis, which gains the ascendant over the proper symptoms of the disease, and sometimes appears to be the cause of the patient's death.

There is great variety in the state of suffering. Some individuals appear to be scarcely conscious of illness, while very many are miserably wretched and impatient, passing their nights in a state of unhappy and discontented delirium, and declaring themselves ineffably wretched, and in the early period of the disorder are liable to acute headach, which closely resembles intermittent hemicrania: in truth, the disease is often productive of a degree of suffering which is not often exceeded.

There is often a remission of the symptoms after midnight, which continues until morning, when the heat becomes inconsiderable and the extremities cold; then an exacerbation takes place, and the febrile symptoms increase as the day advances: in the evening they are most severe. There is often an aggravation of suffering on every alternate day, the disease being as it were a tertian remittent: the type is not very distinctly marked, yet it is sufficient to lead the attendant to observe that a good day and a bad day regularly succeed each other.

In females symptoms of hysteria are often manifest during gastric fever, such as attacks of faintness, palpitation, sobbing, pale urine being passed in profusion.

We would remark with respect to these symptoms, when they are discovered in this or any species of continued fever, that they enhance the perils to which the patient is exposed; whereas when hysteria is an adjunct to any other disease, we are led to subtract from the estimate which we might otherwise have formed of the amount of the danger.

In successive seasons we may remark a considerable variety in the symptoms of the fever; for example, the state of the surface of the body varies considerably. For two or three years, from 1827 to 1829, there was an entire absence of eruption of the skin, with the exception of the white miliary rash, which in many patients was to be found in the hollow above and below the clavicle, and in the sides of the thorax over the false ribs. This rash, probably, belongs to the gastric more than to any other species of fever; we do not include rheumatic fever, whether common or puerperal, which has its own miliary rash, but limit this observation to epidemic fevers. During the first quarter of the present century, the miliary eruption was very rare; with a slight exception during all that time, the miliary rash was nearly absent. During the last five, but more especially during the last three years, the miliary vesicle has been very common. During the winter of 1830, if the red miliary rash be papulæ, with minute suppurating heads, that eruption was observed; about the same time petechial eruptions re-appeared (after an absence of several years) as symptomatic of the fever under consideration: the petechiæ, however, were rather clear, diffused maculæ than the florid or purple stigmata, to which, perhaps, the term ought to be limited.

No precise duration can be assigned to gastric fever. We have seen it observe a septenary period, although obscurely. Sometimes it extends not beyond one week; we have known it exist for three months, but its course is sometimes even much more extended. It is exceedingly under the influence of regimen. When pursuing its course silently and unobserved, it may be roused so as to be attended with both suffering and great danger by stimulating ingesta, fatigue, or anxiety. In like manner, also, relapses are very often produced.

There is much obscurity with respect to the infectiousness of gastric fever. To us it has appeared that this species of fever is sometimes infectious and sometimes not. For several years the fever appeared in families only in solitary instances, or if more than one were affected, they were seized nearly at the same time; but it did not extend so as to lead us to think that it propagated itself. We were unable to assign the cause of the disease further than that we observed, in several houses in which our patients lay, that fetor which is discoverable when a sewer is choked, and in some instances upon inquiry it was found that the sewer leading from the house had been improperly constructed and neglected. In one patient the disease commenced in the middle of the Atlantic Ocean, and a fortnight before he reached land. But it would not be safe to affirm that in the winter of 1830 the fever did not possess an infectious property; in virtue of which, and exclusive of every endemic influence, it spread through families. Thus the family of a gentleman of fortune, part of them from England and part from Ireland, met in the latter end of autumn in a large mansion in the most airy part of the city of Dublin. One of the young people from the county of Cork, who had been indisposed for several weeks, was obliged to betake himself to bed shortly after his arrival; then one of his sisters fell ill, then a second; then a footman who had attended his young master; then a housemaid; then a third sister; then a brother; then a fourth sister; and lastly a fifth and sixth sister, both of whom had come from England during the confinement of the first patient. These individuals were sickening in succession during a period of upwards of three months, and the cases differed only in severity. One of the patients, the footman, died, and the eldest of the young ladies did not require to go to bed; yet were the symptoms of the same kind in all these cases. Many instances of the extension of this fever in families occurred within our observation during the winter of 1830 and 1831, which, although not so conclusive as that just related, induced us to think that gastric fever is sometimes an infectious disease.

This disease depends upon an excited state of the stomach and intestines, which would seem to have been inflamed; but this state is by no means identical with common inflammation. After death, the mucous membrane of the stomach is found thickened, unusually vascular, in many places of a bright or deep red colour, sometimes with blood effused underneath; the vascularity of this membrane is often rather that which would indicate congestion in the veins than in the arteries. There are, however, cases in which ulceration and even perforation of all the coats of the intestines have taken place.

The following case and dissection will illustrate many of the foregoing observations:—W. V., who had been ill for many days, was visited by his medical attendant for the first time on the 13th of November, 1829. He had a sunken expression, his face was covered with perspiration, pulse 120, and weak. He complained of pain in the back of the neck and head, which was removed by some mild opening medicine, and never returned. For the next four weeks he was confined to the house, and engaged in business which harassed him much. He had all the time the same expression of countenance, a strong tendency to perspiration, particularly after the smallest dose of antimonial or Dover's powder. His bowels were at all times very free, having three or four evacuations every day without medicine; his sleep was without refreshment; his appetite at first unimpaired; his tongue morbidly clean; his pulse quick and tolerably firm; he chiefly complained of debility, and never of the smallest pain in any part of the body. During the last ten days of his life he was confined to bed. About the 12th of December he became slightly delirious, but still was sufficiently collected to know every one about him, and occasionally to speak on business. He was sunk in strength, his pulse was quick and weak, tongue dry and chappy, great thirst; two or three times he vomited a small quantity of fluid the colour of verdigris. On the morning of the 14th he had a profuse discharge of blood per anum, when he became nearly exhausted; his face was covered with a clammy sweat, extremities cold, and pulse at the wrist imperceptible. Involuntary discharges of clotted blood, slight tenderness of the abdomen—death.

Throughout the attack, medicine appeared to exert too powerful an influence. A few grains of rhubarb produced numerous fluid stools; a few grains of Dover's powder occasioned profuse perspiration. On one occasion he got a little quinine, which disagreed and was discontinued.

Dissection twenty-four hours after death.—On opening the abdomen a great quantity of the same kind of fluid which he had passed per anum flowed out and ran about the floor. The intestines were largely distended with flatus of insufferable fetor. The liver was of a dark green colour; the gall-bladder greatly distended with bile. The lesser omentum was black and gangrenous; its structure giving way under the finger. The stomach of the usual size. On opening it, the mucous membrane presented a singular appearance; it was thickly coated with lymph, which appeared in masses resembling small glands, of the size of half a split pea; towards the cardiac orifice and at the greater extremity of the stomach, the surface was very dark-coloured, almost black, and had much the appearance of gangrene. There was a large ulcer, of more than the size of a shilling, which penetrated through the substance of the stomach; its edges were thick, elevated, and rough on the internal side, more smooth on the peritoneal side, but still thickened: the viscus appeared more healthy towards the pylorus, which was greatly contracted in size, and scarcely permitted the passage of the little finger. Along the tract of the lesser intestines very vascular patches were observable on the peritoneal surface. A portion of the intestine close to the termination of the ileum, about eight inches in length, was removed and slit open. On the mucous surface there were seven or eight ulcers, elevated at the edges and hard. One of them was sloughy, and penetrated through all the coats of the intestine into the cavity of the peritoneum; the surface was smeared with the same kind of bloody fluid already mentioned. The great omentum was thickened, of a dark mahogany colour, evidently in a state of inflammation approaching to gangrene.

There is one consideration which vindicates the publication of this case of gastric fever, namely, that it illustrates an important peculiarity in the disease. Extensive mischief often takes place in the abdomen without there being any symptom, such as great heat, tenderness, pain, or tumefaction, till within a very short time before death, to indicate that a disorganizing process is going forward.

Treatment.—The morbid action of the mucous coat of the intestines does not terminate as common inflammation does, but produces excessive secretion; yet this increase of secretion does not, at least in the first instance, relieve the irritation of the surface from which it proceeds: frequent copious watery stools are often productive of no relief, and yet they may not safely be checked — we may moderate, but we must not suppress these discharges. If these discharges do not reduce the strength of the patient, if they occur not more than three or four times in the day, the less we do the better. We may prescribe mild glysters, light and nourishing drinks in small quantities, barley or rice water with a little isinglass, or gum-water with syrup of capillaire: we may moderate the heat of the surface by tepid affusion or sponging, equalize the circulation by fomenting the legs, and applying cold water and vinegar to the head: while we ensure ventilation, we must not reduce the temperature of the apartment below fifty degrees; and, finally, we are not to employ internal medicines, whether purgative or astringent, without a very clear indication. In truth there are many cases in which nothing can be done by the physician, but to ascertain, at each successive visit, that there is no aggravation of any of the symptoms of the disease. And yet it is of great importance to recollect that there is no disease in which he is in greater danger of losing the confidence of his patients, unless he explains the probable duration of the fever, and the danger which often suddenly arises even in the mildest cases. In reference to the great proportion of cases in which the practitioner is not required to interfere, the writer cannot help alluding to a physician, originally a man of very energetic measures in the treatment of fever, who, it is said, became, within the last two or three years of his life, remarkable for his "milk and water practice." Now if the physician alluded to was treating the disease under consideration, as there is reason to believe he was, he evinced his skill; for had he in most cases employed either depletory means or stimulants, fewer of his patients probably would have recovered than actually did. Long and watchful practice confers no greater boon than in enabling a physician to be inactive without loss of character, or the danger of being supplanted by those who think it necessary to practise, not only for the benefit of their patients, but on the credulity of the attendants or friends of their patients.

If the discharges exhale a pungent or fetid odour, we may give charcoal, recently and finely levigated, in doses of fifteen or twenty grains. If the discharges are very frequent or excessive in quantity, they may be checked by means of enemata of laudanum and mucilage. The enema, for an adult, consisting of fifteen or twenty drops of laudanum in two ounces of mucilage of gum-arabic or starch, administered immediately after a stool, and kept from passing off by means of a towel pressed against the anus, will often check the discharge for many hours. In this state of the bowels a quarter or one-fifth of the grain of the watery extract of opium, with two or three grains of rhubarb every fourth or sixth hour, will often be found useful. If, on the contrary, the bowels have ceased to act, and the patient become heavy and oppressed, a mild aperient glyster, gruel with soft sugar, and a small quantity of Glauber's salt, or an aperient draught of the mildest kind, by resuscitating secretion will relieve the whole system from oppression. It is very remarkable in this disease how small a dose of any medicine, whether aperient or astringent, will produce a sensible effect; and hence it would appear highly important, as our object is often merely to avoid extremes, not to give medicines in an over-dose.

When the bowels are not in a state to require either purgative or astringent medicines, (and this will very often be the case,) the mineral acids may be given generally with great benefit. The writer has in general preferred the nitro-muriatic acid: two drops of the nitric, and four of the muriatic, in a large wine-glassful of water, may be given every second or third hour; in general this draught will prove not only beneficial, but very agreeable to the palate and feelings of the patient, tending to quench thirst, remove the disagreeable taste, and allay fever and irritability.

As the disease advances, very weak chicken-broth or beef-tea will be useful, and the patient will sometimes require wine, but it must be given very sparingly; an ounce, or even half-an-ounce of claret diluted, and given every third or fourth hour, generally will prove a sufficient quantity, or a table-spoonful of sherry in a little soda water, or one or two table-spoonsful of Hoc or Barsac in Seltzer-water. No point of practice more requires to be well considered than the exhibition of wine in this species of fever. There is a species of debility produced by an excited state of the mucous membrane of the stomach which wine will not relieve, but which will yield to topical bleeding; this often attends the earlier part of the disease, when indeed it will very seldom be necessary to give wine; in its more advanced stages, when much exhaustion is complained of, when the pulse is characterized by smallness, irregularity, or inequality, and when the circulation in the extremities is languid, we must give wine, but very cautiously; and we must be prompt in withdrawing the allowance of wine upon any general re-action or local determination taking place. There are two principal terminations of fever, one by a change in the distribution of the fluids, the other by those vessels which have been in a state of congestion returning to a more natural condition. In both of these there is increased or altered secretion; in the former, from a part of the system distant from that principally affected; in the latter, often from the affected surface. In catarrhal, gastric, and enteritic fevers the disease very generally terminates by secretion from the affected mucous membrane, and the resolution of the disease is almost insensible. Now, as a general rule, it will be found that wine is little needful in this class of fevers; indeed in most of the cases it may altogether be dispensed with.

In gastric fever with a dry tongue and tympanitic abdomen, chicken-broth, or Seltzer water with milk, will be preferable to wine; at all events wine ought not to be given at the first appearance of these symptoms. The tympany may often be removed by means of spirit of turpentine, but will generally soon return; and turpentine, at each successive dose, will be found of less and less efficacy. Emollient enemata, terebinthinate fomentations, blisters to the abdomen, nitre largely diluted, from ʒss to ʒi to sixteen or twenty ounces of almond or arabic emulsion, taken in the course of the day, with small doses of rhubarb, was the treatment most applicable to this state. When the tension is removed, wine is sometimes needful, or a tea-spoonful of brandy in a small cupful of warm milk or gruel every three or four hours, may be given with advantage.

When the patient is restless and uneasy, a change of bed will often prove most tranquillizing. When the circumstances of the individual will permit, there ought always to be two beds in the chamber. There ought also to be an easy-chair, in which the patient, when able to leave his bed, may sit, half recumbent, during part of the day; in which position, with his legs on a footstool, fomentations may conveniently be applied to the whole of the lower extremities.

Is bleeding requisite in this form of fever? Very often it is. When in a young and healthy patient there is early in the disease much vascular re-action, nothing will prove so useful as the loss of eight or ten ounces of blood; and when tenderness and heat of the abdomen are discovered at any period of the disease, from eight to eighteen leeches may be applied. So also ought we to proceed when there is excessive irritability of the stomach, with unquenchable thirst. But we are not to bleed as if the disease were to be extinguished by bleeding; this it cannot be—we may expect to moderate the severity of the symptoms by bleeding, to restore secretion if it be suspended, to moderate secretion if it be excessive; but as the disease generally has a long course to run, and as the issue will depend upon the strength of the patient being husbanded, if there is nothing in the intestinal tube which indicates inflammatory irritation, our part will be, not to bleed, but to allow the disease silently to wear itself out, unless in those cases in which inflammation is kindled up in the progress of the fever in other organs, in the lungs for instance, which was often the case while an influenza prevailed in the winter of 1829. In one of many such cases the writer directed 60 ounces of blood to be taken within five days from a lady in the third week of gastric fever, to subdue a bronchitic attack which was superinduced; he has also been obliged to employ the lancet freely, in order to relieve encephalitic attacks.

It may not be useless to remark, that within the last ten years the lancet has not been in such requisition as it was during the preceding decade: the fevers in general have had less of an inflammatory character. Irish physicians of the present day, who are eminently skilful in the treatment of acute diseases, are almost all eclectics, have no fixed routine of practice, but are equally ready to act with the decision which those dangerous contingencies above alluded to may require, or to remain calm spectators of a distemper which often requires nothing more than the *dieta aquea* from the beginning to the end.

This is not a fever which requires a mercurial every night and a drench of infusion of senna and salts in the morning. It would be most mischievous to give purgatives daily; you thus increase the peristaltic movement, and disturb the bowels when it is of the greatest moment to keep them at rest. There are three points to be attended to in gastric fever, as contra-indications, before we prescribe a purgative: first, the outline of the abdomen—when the ribs are prominent and the belly soft; secondly, the condition of the stomach—when the stomach is irritable, the patient complaining of nausea and sickness, with tenderness of the epigastrium; thirdly, the quality of the discharges from the bowels—if these be serous or mucous, or rendered such by purgatives, then let us withhold these medicines, or administer them with the utmost caution. The purgatives which the writer generally employed, were rhubarb with manna, phosphate of soda in weak broth, Rochelle salts, or a solution of soda taken with lemon-juice; citrate of magnesia, or sulphate of magnesia in infusion of roses. When there was evident deficiency of bile in the stools, blue pill or quicksilver with magnesia, with or without Dover's powder, in minute quantity, were often prescribed.

The management of the surface of the body is of considerable importance. Every evening, (so long as the patient retains sufficient strength) when the heat of skin and anxiety are greatest, the writer is persuaded, from trials made under his own observation, that the tepid shower-bath will be found a valuable remedy. Tepid fomentations to the limbs, renewed frequently, for at least an hour at a time, two or three times in the day, and especially before the usual time of going to rest, will often remove the febrile irritability and dispose the patient to sleep.

John Cheyne.

FEVER, INTERMITTENT, or AGUE.—This disease may be conveniently considered under the three following general heads:—1. simple or mild intermittent; 2. complicated or malignant intermittent, equivalent to the *fiévres intermittentes pernicieuses* of the French writers, the *febres intermittentes comitatæ* of Torti and others, and the *epiala* of Galen; 3. masked intermittent, or the *febres intermittentes larvatæ* of authors.

1. Simple or Mild Intermittent Fever.—This disease consists of a series of febrile paroxysms recurring at times more or less regular, and alternating with apyrexia nearly if not quite perfect. There is generally but one fit in the space of twenty-four hours.

The time intervening from the commencement of one paroxysm to that of the paroxysm next succeeding is called an *interval*, whilst an *intermission* comprises the period from the cessation of one fit to the beginning of the next.

Ague displays itself under three principal forms, which may be considered as *genera*, if the disease constitute an *order*, as it does in the nosology of Dr. Cullen, or as *species*, if it be considered merely a *genus*. These are—

1. Quotidian, having an interval of twenty-four

hours, the accession of the paroxysm being early in the morning.

2. Tertian, having an interval of forty-eight hours, the paroxysms occurring at or about noon.

3. Quartan, with an interval of seventy-two hours, the fit commencing in the afternoon, generally from three till five o'clock.

There are sundry deviations from these leading types, but to narrate them all would be a burden to the attention and memory of the reader without proportionate instruction. It will be sufficient to point out those varieties which are of most frequent occurrence.

The double tertian is very often met with. A paroxysm occurs daily, and hence the disease would naturally be supposed to be quotidian; but on observing its course and comparing the paroxysms, it will be found that those of alternate days only correspond in duration and violence, and that they commence about noon. It appears as if the fits of a milder disease were inserted between those of one more severe.

A triple tertian occurs daily with two paroxysms on one day, and on the other one only.

A duplicated tertian returns only on alternate days, but on these days has two paroxysms.

The double quartan has a paroxysm, generally slight and of short duration, on the day succeeding that of the regular quartan recurrence, so that on the third day only is there a perfect intermission.

The duplicated quartan has two paroxysms on the day of attack, with two days of intermission; thus strictly resembling the duplicated tertian, allowance being made for the difference of the primary type.

A triple quartan has a light febrile paroxysm on each of the days usually allotted to a perfect intermission.

Agues having intervals of five, six, eight, or ten, &c. days' duration are mentioned by authors of repute, but they are acknowledged to be rare. Some of these probably belong to the ordinary types of the disease, and either by the effect of medicines or some spontaneous change in the constitution certain paroxysms appear to be presented, and hence arises the duration of the intermission. Others do not admit of explanation on this principle, but are really what they appear to be, intermittent diseases recurring at intervals of many days; but these are much more frequently masked intermittents, (that is, the symptoms of other diseases, such as hemicrania and various neuralgiæ, or even apoplexy, returning periodically,) than regular agues.

Of the three primary types, the tertian is by much the most frequently met with; the quartan stands next; whilst the quotidian is in some degree rarer than the latter.

The types frequently pass into each other; but we oftener observe that those whose interval is short assume the more lengthened forms than inversely; for instance, the tendency of quotidians to change into tertians is very great. But the contrary mutation, that of a disease of a long interval into one of a shorter, is often observed, and it denotes the increasing severity of the malady, for it is a remark of Celsus that quartan kills no one, but if it be converted into a quotidian, which it never is but by the fault of the patient or his physician, it is then very dangerous. (Lib. iii. cap. 15.) Intermittents, too, not unfrequently assume the remitting form, and this is occasionally attributable to the untimely employment of certain medicines. We very often observe the contrary order, remittents changing into intermittents, and this is the safer change for the patient, as it shows the diminishing intensity of the disease.

Agues are much more frequent in the spring and autumn than during any other season of the year. Those occurring in the former period are generally tertians and quotidians, and are found to yield readily to remedies, whilst those prevailing during the latter are more intractable; and quartan, the most obstinate form of all, (so much so indeed that it is said by Celsus rarely to terminate before the following spring,) is found to constitute a more considerable proportion of the cases.

Symptoms. — The disease rarely displays itself at once under the form of ague in an individual who has not previously laboured under it. The patient feels indisposed, has headach, weariness, and pains of his limbs, thirst, inappetency, white tongue, frequent pulse, high-coloured urine, and dark discharges from his bowels. This feverish state displays its periodical tendency by well-marked exacerbations and remissions, the former generally occurring daily about noon. After this febricula, or fever, for though sometimes slight it is occasionally severe, has endured for a time varying from four days to a fortnight, the patient is seized with a severe rigor, and the ague which the medical attendant, if experienced in this class of disorders, had been expecting, manifests itself.

The paroxysm commences with a sense of creeping or coldness running down the back, the nails turn blue, the features become pale and shrunk, the skin wears the appearance of what is called goose-skin, and the pulse is small and rapid. The coldness soon becomes general, and amounts to shivering with chattering of the teeth; cough, dyspnœa, and oppression of the præcordia occur; there is a sense of painful constriction round the temples; severe aching in the back; nausea and often vomiting. This, when it occurs, seems to have the effect of bringing on the hot stage more speedily; though, without such an occurrence, it succeeds the first stage after it has lasted for a period varying generally from half an hour to two hours and a half. The hot stage is denoted by great heat of the surface, a forcible pulse, intense thirst, dry tongue, headach with throbbing of the temples, and scanty and high-coloured urine; in short, by all the indications of an ardent fever. The mean duration of this stage is from three to eight hours. At its close a gentle moisture, which soon amounts to a profuse sweat, appears on the skin; the pulse becomes remarkably full without losing much of its frequency; the headach and thirst subside; the urine, which during the cold stage had been deficient, pale, and limpid, and in the period of excitement had almost ceased to be secreted, is discharged copiously, and deposits a lateritious sediment; and the bowels are either evacuated spontaneously or are readily amenable to cathartic medicine. At the termination of the sweating process the patient feels as if restored to health, a sense of exhaustion excepted. On the following morning, should the case prove a quotidian, about noon of the third day, if a tertian, and in the afternoon of the fourth, should the disease be a quartan, the coldness again commences, and there is a repetition of the symptoms which have just been described.

The duration of a paroxysm varies in the different types. It will be very near the truth to estimate the mean length of the whole paroxysm of a quotidian at sixteen hours, whilst a fit of tertian completes its stages in ten hours, and a quartan in six, of which fully two are occupied by the cold stage. Any considerable excess beyond these periods constitutes a protracted paroxysm of the respective diseases. When this protraction takes place in a quotidian, it is manifest that there can be little or no intermission, and most modern observers would perhaps term such a disease remittent fever, between which and intermittent the boundary line is often very faint. The Greek writers named it *amphemerina*, and the Latins *quotidiana continua*.

The paroxysms of all the forms are apt to vary the time of their recurrence, that is, to commence at an hour somewhat earlier or later than those which preceded them. It may be remarked that retarding are generally to be preferred to anticipating fits, the former showing the power of medicinal agents over the disease, the latter that it is still uncontrolled. Though it appears certain that ague, like other febrile diseases, has a tendency to undergo a spontaneous cure, or, as it is expressed, to wear itself out, yet this disposition is counteracted by so many circumstances, and our opportunities of witnessing the unassisted power of the constitution over any disease are in the present day so rare, that it is impossible for us to give from observation any suggestion as to the time generally required for this natural cessation. The ancients, whose opportunities of estimating the unaided or imperfectly aided influence of nature over disease were infinitely greater than ours, give us little more information on this point than that already quoted from Celsus, and which has frequently been confirmed by others, that quartans, which generally commence in autumn, rarely cease till spring, and an intimation that a tertian *might* cease spontaneously, or at least without the employment of anti-periodic remedies which they were ignorant of, at the third paroxysm. (Lib. iii. cap. 14.) It has sometimes, though but rarely, occurred to the writer to see quotidians and tertians cease without the employment of any remedies of that description, after three or four fits, the cessation coinciding with the appearance of an abundant herpes labialis, an appearance always of the best omen in this class of diseases, whether intermittent or remittent. But he has never observed this in quartans, which are much less yielding than the other forms of the disease, and are more frequently complicated with those visceral affections which, from being effects of the disease, become its perpetuating causes, and invest it with a character of great obstinacy. These complications, it must be remarked, not unfrequently occur in the course of tertians and quotidians, and render them intractable, but they are less essentially a part of them than of quartans.

The tendency to relapse is great, and it is very apt to take place on the days corresponding to that of the paroxysm, and hence great caution should be observed after the interruption of the disease, as to avoid exposure to cold and fatigue, and respecting diet, particularly on these days. A gentleman who had recovered from ague had a relapse at Lisbon from drinking a glass of iced lemonade on the day corresponding to the tertian period, which was the form he had laboured under. Causes apparently slight may occasion a recurrence of the disease at periods so remote that the term relapse would scarcely be applicable. The late Dr. Gregory of Edinburgh was in the habit of relating in his lectures the case of a young West Indian, who, having at some former period suffered under ague, struck his shin against the scraper in going into the class-room of the Institutes of Medicine, and had immediately a paroxysm of the disease. The writer was stationed at Canterbury in August, 1814, with the corps of cavalry of which he then had medical charge, and which had recently returned from the Peninsula, where very many of the officers and soldiers, perhaps the majority, had laboured under ague. The wind set in suddenly and coldly from the east, and immediately his hospital, in which for months there had been no cases of the disease, was filled with intermittents.

Complications and sequelæ of the disease.—It may appear inconsistent to speak in the present department of complications, but it is intended that only such lesions of structure shall be noticed here as result from a long continuance of a mild disease, those dangerous organic changes which are almost essential to the nature of malignant intermittent being reserved for future notice. The tendency of the simplest kind of intermittent to affect the viscera of the abdomen is very great, as is shown by the following fact: if any cathartic be given to a patient immediately after even his first fit of ague, a quantity of dark bilious matter is discharged from his bowels. During the cold stage the blood seems to be largely accumulated in the veins of the viscera generally, and very much so in those of the portal system, so that we find the functions of the alimentary canal and the liver disturbed early in the disease; and merely by its long continuance, even should its general character be devoid of all malignancy, serious organic affections are occasionally produced. That the accumulation of blood in the viscera during the cold stage is considerably instrumental in engendering them, is shown not only by general reasoning of a very obvious nature, but by the fact that these morbid affections arise more frequently in the quartan, which has the longest cold stage, than in the other forms of intermittent. The following case may serve to illustrate the effect of venous accumulation in generating structural changes. It once occurred to the writer to see a person die in what appeared to be the cold stage of a first fit of ague. Heat applied in various modes, ammonia, ardent spirits, ether, and other stimulants, failed to bring on re-action. He lay as cold as marble, and shivering violently, without any pulse at the wrist, and his heart acting very feebly for eighteen hours, and then expired, his intellect remaining unclouded till within a few minutes of his dissolution. The principal morbid appearance discovered was in the liver. This viscus was very much enlarged, and extending below the cartilages of the ribs towards the umbilicus, had a lobulated appearance, and was gorged with blood; it seemed, indeed, as though it had yielded in those few hours to the pressure of the fluid which distended its vessels. The man had not previously complained of indisposition, but had undergone cheerfully the toils of the Peninsular war, performing his duty as groom to an officer.

To this cause, the remora of blood in the veins of the viscera during the cold stage, is superadded the *arterial* congestion of the same organs during the stage of excitement; the word congestion, which it must be observed has been used in various senses, being here employed in the signification, now we believe the most usual, of determination of blood, a part of the state of inflammation, but which may exist independent of it, though its long continuance or frequent repetition has a tendency to induce it.

The disposition to these affections of the abdominal viscera is early displayed by a furred state of the tongue and a considerable degree of epigastric tenderness increased by pressure. They are occasionally fully formed during the persistence of a long-continued intermittent, and sometimes, their rudiments being then laid, they attain a fuller development after it has ceased or been subdued by medicine, especially if the patient remain in the climate where the disease commenced. Their existence is indicated by the following signs. The countenance of the patient is pale and bloodless, and if the disease be of some standing, appears puffed and œdematous; occasionally it has a yellow tinge, and yellowness is almost always perceptible in the conjunctivæ; there is great debility, and the patient is breathless on slight exertions; the epigastrium and both hypochondria appear and feel full and distended, and are tender on pressure, but independently of pressure there is a sense rather of weight than of pain, or at most of very obscure pain extending from the epigastrium to the spine. Pain or aching is experienced, too, about the right shoulder or shoulder-blade. The discharges from the bowels are found to be clayey; the urine is high-coloured, with occasionally a jaundiced stain; the tongue has the exanguious appearance of the countenance, and is covered with a white or cream-coloured fur; and the pulse is generally small, feeble, and frequent. If these symptoms remain unsubdued or undiminished, diarrhœa or more frequently chronic dysentery and general dropsy supervene, and finally death closes the scene, though generally at a long interval from the commencement of the disease.

In many cases, instead of this complicated state of derangement, in which the spleen, liver, and occasionally the pancreas are involved, we find an affection of the first of these organs only, constituting what is commonly called ague-cake. This is denoted by a hard swelling in the left hypochondrium, always indolent at first, and sometimes remaining very long so, and influencing little the general health; but occasionally attaining a great size, becoming extremely painful, and, in climates warmer and more infested with intermittents than our own, inducing rapid death by rupture of the organ. Persons labouring under these enlarged spleens are observed to be very subject to foul ulcers of the legs. (Morgagni de Sedibus et Causis, Epist. xxxvi. 18.)

Post-mortem Appearances.—The milder form of the disease we are now considering is fatal only by means of the consequences of its long continuance which have just been described. The morbid changes generally discovered in fatal cases are, the cellular membrane and serous lining of the cavities distended with fluid, and organic disease in the liver, spleen, and intestines.

The change discovered in the liver consists frequently of augmentation of the bulk of the organ and of the density of its texture, as if from interstitial deposition. In other cases its consistence is diminished, the whole organ appearing to be converted into a dark-coloured pulp resembling a mixture of effused and coagulated blood and shreds of membranous matter. Both the indurated and the softened state are sometimes found coexisting with tubercles dispersed through the viscus. Occasionally the texture is merely more friable than natural, not in the extremely softened state mentioned, and contains small and detached purulent deposits. The only change discovered is sometimes in the bulk of the organ, the texture remaining natural, as in a case related by Grottonelli, in which it had acquired such a size as completely to mask the stomach and intestines, the left portion extending into the left hypochondrium and adhering to the spleen, so that it could not be separated without tearing, the substance being nevertheless perfectly sound.*

The spleen is often found much enlarged, sometimes to quadruple its natural size, and to the weight of six or eight pounds. Morgagni, indeed, mentions a case in which it attained the weight of eight pounds and a half, and occupied nearly the whole of the left side of the abdomen. (Epist. xxxvi. p. 17.) Such enlargements coexist with affection of the liver, but, as already stated, are found to be consistent with a healthy condition of that organ. The density of the viscus is occasionally increased; but in the majority of instances its interior texture is remarkably soft, and it becomes evident that the hardness felt in the left hypochondrium before death had arisen from the extreme distension of the tunic of the spleen from the quantity of fluid effused into the organ; and the pain felt in a viscus possessed of little sensibility appears to arise from inflammation of its covering induced by the same distension. This inflammation is often visible after death, the tunica propria being highly injected, as if by art. When the organ is examined, it is hard, tense, and resisting; but on being cut it is found to consist interiorly of fluid, sometimes greyish-black, sometimes having the deep purple of lees of wine, intermixed with mere shreds of fibrous or membranous matter. Should death take place from rupture of the spleen, it is preceded by lancinating pain of the abdomen, small and frequent pulse and cold extremities; and on opening the cavity it is found to contain a quantity of dark-coloured fluid which has flowed from the spleen, in which either one or more small crevices, or round and ulcerated apertures, are found. A case is mentioned by Professor Morelli, of Pisa, in which an enlarged spleen had contracted an adhesion to the left extremity of the colon, where it turns to form the sigmoid flexure, and its contents had thus been discharged by stool, the patient being supposed to labour under malæna. A case is related by M. Gasté in the Bulletin de la Societé Médicale d'Emulation, in which there was found in the left hypochondrium a large peritoneal pouch circumscribed outwardly, above, and posteriorly by the diaphragm, within by the stomach, and below by a small portion of the colon and the left kidney. This sac contained two pints of a sanies resembling wine-lees, and the spleen occupied the lower part of it. This organ was of its natural size, but its surface was tuberculated, and its concave part displayed several irregular ulcers from half an inch to two inches in diameter.

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* Ad acutas et chronicas splenitidis eidemque succedentium morborum historias animadversiones. Florentia, 1821.

Should dysentery have existed before death, there will be found ulceration of the great intestines.

Remote Causes.—The most uniformly operative of these is, unquestionably, malaria; indeed, it may be doubted whether any case of idiopathic intermittent can occur independently of its agency, either as a predisposing or exciting cause. (See Malaria.) Other circumstances may co-operate: an individual, for instance, debilitated by privations of food or sleep, by debauchery or fatigue, is more susceptible of the influence of this poison than one whose strength is unimpaired, and should he be attacked with ague, some of the circumstances enumerated may be considered as the predisposing causes of the disease, and marsh miasmata its **exciting cause.** On the other hand, an individual who has been exposed to the effluvia of swamps, may suffer a fit of ague at once from some trifling circumstance, such as drinking a glass of iced lemonade, (an example of which occurred in the person of the writer,) exposure to cold, &c. when the effluvia should be regarded as the predisposing cause.

Some authors have supposed ague contagious. This was the opinion of Baunarez and Cibat in Spain, Bailly and Audouard in France, and Cleghorn and Fordyce in our own country. Cases have fallen under the writer's observation which have led him to entertain at least a suspicion that such was the fact; but the most forcible case for the affirmative of the question which he has met with is one related by Bailly. "A lady arrived in Paris with an intermitting fever, which she had contracted in the country in a marshy situation. This fever was accompanied by violent vomitings and other serious symptoms, which displayed themselves at every paroxysm, and forced me to give bark. Scarcely was she cured, when her husband, *who had never quitted Paris*, but who had had the imprudence not to keep himself apart from her during her illness, was struck with the same symptoms and in a manner altogether similar."

The proximate cause or nature of intermittents will be considered after the symptoms and morbid appearances of the complicated and malignant form have been presented to the reader.

Treatment.—This will be best understood by our examining into the merits of the various remedies employed for the cure of intermittents, and endeavouring to indicate the circumstances of the disease to which they are respectively applicable.

1. *General Bloodletting.*—Though frequently useful and often imperiously demanded in the complicated form of the disease, this remedy appears to be one of doubtful value, or even safety in mild intermittent. At the commencement of ague it is very usual to find the intermissions too imperfect to admit of the anti-periodic remedies, such as quinine or arsenical solution, being resorted to for terminating the disease; but antiphlogistic diet, mercurial purgatives with antimonials, and local bleeding to the epigastrium if there be tenderness in that region, will generally suffice, without the assistance of general bleeding, to bring the patient into the condition required for their administration. Should, however, ague in any part of its course be complicated with inflammation, existing, not only during the paroxysm but in the intermission, in such intensity as would under other circumstances indicate the propriety of general bleeding, then it should be employed without hesitation. The writer can state from experience, that cases which had resisted the usual anti-periodic medicines, the disease being kept up by a local inflammation, have been made amenable to their action by bloodletting. But the propriety of practising it indiscriminately as a remedy for ague seems more than questionable; nor, should circumstances render its employment advisable, does it appear to be established that the cold stage of the paroxysm, which is the time selected by Dr. Mackintosh for its employment, possesses any advantage over the intermission, when it is generally performed. The latter period, on the contrary, seems better suited for giving the physician a precise knowledge of the extent of the local disease, and for enabling him to adjust the quantity of blood to the necessity of the case.

The gentleman above mentioned published, in the 27th and 28th volumes of the Edinburgh Medical and Surgical Journal, two papers, advising the employment of this remedy in the cold stage of ague, and containing eight cases illustrative of the efficacy of the practice. Of these cases, four certainly appear to have owed their recovery principally to the bleeding, but in the remaining four the cure was accomplished by quinine; and there is great reason to think that it would have taken place sooner had that remedy been employed earlier, though the bloodletting had been omitted. The four cases in which the practice was successfully employed were of very long standing; and there is every probability that in them the disease was perpetuated by chronic inflammation of some viscus, though only in the eighth case are the symptoms so detailed as to enable us to fix on the site of the inflammation. In this case it was in the spleen; and all these cases fall under the description of cases to which we have argued that bleeding is applicable. The practice of Dr. Mackintosh, as a general remedy of ague, was subjected to a full and candid trial by Dr. Stokes and Mr. Gill, a narration of which will be found in the 31st volume of the Edinburgh Journal· and if the reader will refer to it, he will probably agree in the sentiment expressed by the former of these gentlemen, that the result is calculated to convey an impression unfavourable to the indiscriminate or even frequent use of bleeding in the cold stage of this disease.

Local bleeding is a safe remedy, and the application of leeches to the epigastrium or either hypochondrium is often of great benefit in the slighter gastric, hepatic, or splenic complications which are so frequently met with, and may be with propriety substituted for general bloodletting in the inflammation of any organ, if not of a sufficient degree to keep up constitutional excitement during the intermission. It may be remarked, too, that there is no inconsistency in these moderate depletory measures being promptly followed or even accompanied by anti-periodic remedies, such as arsenical solution or quinine.

It should be observed that the intermittent fevers of warm countries require and bear more free depletory measures, both local and general, than those of temperate climates. So decidedly is this the case, that many persons familiar with the agues of Rome and Sienna, where they are probably more prevalent than in any part of the world, always commence their treatment by bleeding from the arm.

Purgatives.—These are important remedies in the treatment of this disease, and circumstances counter-indicating their employment are of very rare occurrence indeed; a very unusual degree of debility alone forbidding their exhibition, should other symptoms render it advisable. Those containing a proportion of calomel, or some milder mercurial preparation, should be preferred, from the tendency which the disease displays to derange the biliary system. It was the writer's practice always to empty the bowels by such a purgative after a paroxysm previously to giving bark or arsenical solution, and to repeat it occasionally throughout the disease if it appeared advisable; and the result generally showed the propriety of the plan. Irritation or even inflammation of the gastro-enteric mucous lining should not be considered a reason for withholding this class of medicines, for the worst cases of ulceration or other disease of this membrane have been found in the practice of those who abstained from them; and it may be considered as ascertained that their judicious exhibition neither tends to induce such disease nor to aggravate it if existing; though it certainly is possible to excite considerable irritation there, by needlessly tormenting the bowels with purgatives.

Emetics.—It is the practice of many medical men to give an emetic at the commencement of the cold stage, or a short time prior to the period of its expected recurrence, provided this be ascertained. Its administration in the first mode has generally the effect of shortening the cold stage, and rendering the whole fit milder; whilst the giving of it before the fit occasionally prevents this altogether, and breaks the catenation of the fever. Its exhibition in either mode should be considered only preparatory to the employment of anti-periodic remedies; but with this view it may be usefully adopted where there is no tenderness of the epigastrium, the existence of which should be considered as counter-indicating it.

Mercury.—The use of this mineral should be directed rather to the complications of the disease than to the disease itself. Ague is almost uniformly suspended by mercurial action; but besides that we can in uncomplicated cases generally attain the same object by milder methods, it must be remarked that the cures effected by its agency are rarely permanent, the disease occasionally reappearing immediately on the cessation of its action, or shortly after. But in the treatment of the gastric and hepatic complications of intermittents it is of great value; and no experienced medical man would withhold it in such cases. Its employment may proceed *pari passu* with that of quinine or other anti-periodic remedies; or the complications being removed, and the recurrence of the paroxysms being suspended by its action, those remedies may be administered as a security against relapse of the primary disease.

The subject would be left imperfect did we not mention the vigorous employment of calomel in intermittent fever by our practitioners in India. They administer it in scruple-doses for one or two nights, giving a purging draught on the following morning to carry off the vitiated secretions; and it is subsequently continued in more moderate doses till the tongue becomes clean, when bark is administered. (*Annesley*, Sketches of Diseases of India, p. 491, &c.) By the same authority we are recommended to give a scruple of calomel combined with two grains of opium, to allay the irritability of stomach which so frequently attends the paroxysm.

Opium.—This medicine has been recommended in the treatment of ague from the days of Galen downwards. It may be given either during the intermission, at the very commencement of the fit, or in the hot stage. The first method is that adopted by practitioners who rely upon opium for the cure of the disease. Its employment in this way is little known in this country, but has obtained considerable notice in France from a memoir published by M. Jourdain (Journal Général de Médecine, tom. lxxxvi. p. 305, and *Bailly*, Traité de Fièvres Intermittentes, p. 438) on the potion stibio-opiacée of Peysson, which is a combination of opium and tartar emetic. The inference we should draw from what has been stated of the effect of opium given in this combination, and from what we have seen of its employment in any form during the intermission, is, that it should not supersede the exhibition of the usual anti-periodic medicines, particularly that of quinine. But small doses of opium will even be found a useful addition to the preparations of bark or arsenic in ague occurring in irritable habits, and particularly when it is complicated with an irritable stomach. The second mode of giving it, just at the commencement of the cold stage, shortens this stage very much, and renders the whole paroxysm milder; facts of which patients are so conscious that our soldiers in the Peninsular hospitals regularly applied for an ague-draught (sixty drops of laudanum and a drachm of ether) when they saw their nails turning blue, which is generally the first sign of the commencement of a paroxysm. Lind attributed the following good effects to opium given in the hot stage:—1st. It shortened and abated the fit; and this with more certainty than an ounce of bark. 2d. It generally gave a sensible relief to the head, took off the burning heat of the fever, and occasioned a profuse sweat, free from the burning sensation which affects patients sweating in the hot stage. 3d. It often procured a soft and refreshing sleep to a patient tortured in the agonies of the fever, from which he awoke bathed in sweat, and in a great measure free from all complaints. The same experienced physician was of opinion that the employment of opium during the paroxysms tended, by lessening their force and duration, to render the patient less prone to liver-disease and consequent dropsy.

Various other stimulating matters have been given during the cold stage, with the view of abridging it, and of thus cutting short the whole paroxysm. Oil of turpentine, in doses of half an ounce, has been thus administered, and frequently with advantage. The old means of this kind mentioned by Celsus were the eating of garlic and swallowing pepper suspended in warm water. (Lib. iii. cap. 12.) An active principle of the latter article, *piperin*, has been recently adopted by Dr. Meli, of Novara, as a cheap and, as he assures us, a very efficacious substitute for sulphate of quinine. He advises that it should be given in doses nearly the same as those of the sulphate, repeated at intervals of three or four hours during the intermission.

Mechanical means have been recommended for the attainment of the same object, viz. abridging the cold stage, and diminishing the severity of the whole paroxysm. These are the application of tourniquets or ligatures to the limbs. It is obvious that the effect of a moderately tight tourniquet and of a ligature will be the same, that of detaining the blood in the limbs compressed by them; and certainly the former, which was originally recommended by Mr. Kellie, in Duncan's Medical Commentaries for 1794 and 1797, is the more convenient mode of accomplishing the object. Mr. Kellie informs us that if a tourniquet were applied in the cold fit on one thigh and one arm of opposite sides for two minutes, a mild hot stage was induced, and the patient felt himself quite relieved. The instruments were allowed to remain for about fifteen minutes, and then on their removal the cold symptoms did not return. The same gentleman is of opinion that if the tourniquets be applied previously to the accession of the paroxysm, the cold stage will be entirely prevented, and that whether the cold stage be either shortened or altogether prevented, the following hot stage will be rendered both milder and of shorter duration. This practice is not much employed; but a recent writer, M. Bailly, strongly urges its being adopted in malignant intermittent where there is much to be dreaded from a recurrence of the paroxysm. (Traité des Fièvres Intermittentes, p. 451.)

If any explanation can be given of this singular effect from such a proceeding, it must be found in the impediment presented to that afflux of blood to the interior, which forms so important a feature of the cold fit, by its confinement in the extremities.

Anti-periodic Medicines.—We shall now consider that important class of medicines which are given during the intermission for the purpose of preventing the recurrence of the fits, and of thus curing the disease. We have named them anti-periodic medicines, because the property of curing diseases which recur periodically seems the only one which is common to all of them. That many of them are tonics is true; but their power over intermittents does not appear to be in proportion to their tonic quality, nor is it well ascertained that all of them possess such a quality. No practitioner employs arsenical solution, one of the most powerful of the class, as a mere tonic, nor does it seem certain that it is one; for to infer that it is so from the fact that it cures ague would be reasoning in a circle, and we are not aware of any other whence it could be drawn. Mr. Jenkinson, who has extended its use to painful affections of the bones, recommends its employment only in those cases in which there are regular intermissions; and hence it would appear that in these diseases too it is as an anti-periodic that it is selected. Upon the whole, it seems proper to designate these medicines by the general term here employed, till a fuller investigation of their nature, and of that of the diseases for which they prove a remedy, gives us more precise ideas on the subject.

Of these remedies, the first in importance is certainly the Peruvian bark. A few years ago, a disquisition on the comparative powers of the different species of this drug, yellow, red, and pale, would have been requisite; but as one substance, sulphate of quinine, unquestionably the most valuable gift which modern chemistry has bestowed on our art, now represents them all in practice, such a disquisition would be superfluous. Those only who were in the habit of treating many cases of ague prior to its introduction, and had often witnessed the disgust, nausea, and vomiting caused by loading a patient's stomach with many ounces of powdered wood, can form an adequate opinion of the benefit conferred on our practice by the introduction of the sulphate; and this opinion should be further enhanced by the consideration that the ligneous matter of the bark is certainly a direct obstacle to the operation of the essential part of the mass, for the sulphate decidedly exceeds the gross bark in febrifuge power, even though the latter be equally retained by the stomach.

[It is proper, however, to remark, that in certain, but rare, cases the sulphate of quinia fails, and the powdered cinchona proves successful; a fact which would seem to show, either that cinchona may contain other active anti-periodic principles besides quinia, or that the ligneous matter, however objectionable it may occasionally prove, may still exert some influence by aiding in inducing the new nervous impression which arrests the intermittent. Ordinary doses of sulphate of quinia may, likewise, be associated with advantage with the cold infusion of bark.]

Of the sulphate of quinine, which we shall consider as the representative of bark and all its preparations, two grains repeated every three hours, or four grains every six hours, are generally a sufficient dose in a case of either of the more lengthened forms of intermittent; but in one of quotidian it is preferable to give three or four grains every third hour. In a complicated and malignant disease, when a patient's life probably depends upon the prevention of a paroxysm, it is frequently given in much larger doses, those of a scruple, for instance, repeated at short intervals; and should those previously mentioned not subdue the mild form of the disease, they should be increased; but doses of from two to four grains will generally accomplish all that is to be expected from the drug in the uncomplicated intermittent of temperate climates. The medicine may be given either in pills or in a draught in any agreeable cordial water, to which are added a few drops of diluted sulphuric acid, which very much aids the solution of the salt. The employment of the remedy should not cease with the suspension of the paroxysms, but should be continued some days as a security against relapse.

It will be known to the reader that the propriety of promptly curing intermittents by means of bark was the subject of doubt and controversy from the first introduction of this drug, and that the two most distinguished writers on the subject, Sydenham and Ramazzini, have taken different views of it, the latter attributing all the pernicious results of the disease to the remedy, the former vindicating his favourite from similar charges brought against it by his British contemporaries, and ascribing the evils to their more general cause, the long continuance of the intermittent. That the remedy is unjustly charged with the general abdominal obstructions and enlarged spleens which are so liberally attributed to it, is manifest from the circumstance that individuals so situated that they can procure neither bark nor any remedial assistance for their agues, and in whom consequently the disease follows its course unresisted, as happens to the peasants of the country bordering on the Pontine marshes, have the spleen occasionally occupying almost the whole abdomen; whilst those in whom the disease is promptly and judiciously treated, escape such complications. But it must be remarked that the employment of bark requires discrimination and judgment, and that much injury may be done by the routine practice of "pouring it in," as it is termed. The following circumstances should deter us from administering anti-periodic remedies, and particularly sulphate of quinine—the intermissions being imperfect, and a recent local inflammation. In the former case, should we employ this class of medicines, we run great risk of converting the disease into a dangerous remittent or continued form; we ought therefore, by means of calomel purges, saline medicines, and occasionally topical bleeding, to endeavour to reduce the patient into an apyrectic state during the intermission, previously to commencing their employment. Should a recent topical inflammation of some degree of intensity exist, we should at once proceed to subdue it by bleeding general and local, mercurials, &c.; and if the ague remain after its cure, then may the sulphate be administered; but the antiphlogistic means, with mercurials occasionally, remove both the local and general affection; and if the anti-periodic be employed in this case, it is rather with a precautionary view than because it is rendered indispensable by the existing circumstances of the disease. It must be observed that the precautions here impressed on the reader against employing quinine during the persistence of topical inflammation do not apply to those chronic engorgements of the spleen and other abdominal viscera which so frequently exist in persons long subject to ague, and which are uniformly aggravated by every fresh attack of the disease. Were we to delay the cure of the intermittent till the splenic or hepatic engorgement were removed, months or years might be requisite for accomplishing the object; the anti-periodic, therefore, should be administered at once. It may be remarked, too, that occasionally circumstances exist which render it desirable that the tendency to periodical recurrence should be combated at the same time that measures are taking to subdue a pyrexial or inflammatory state, permanent but slight in degree; in which case arsenic, in the form of Fowler's solution, should be employed in preference to sulphate of quinine, as being less exciting: but should there be observed any increase of the general pyrexial state during its administration, it should at once be withdrawn, and the antiphlogistic remedies alone persevered in. Finally, by examining all the evidence on the subject, and observing the effect of remedies on ague, we shall reach the conclusion that the diseases which have been attributed to bark do not arise from its judicious employment, though they are occasionally owing to its abuse, but in such an immense majority of instances are to be ascribed to the severity and long continuance of a malady either imperfectly treated, or which our art was too feeble to subdue.

[Should the condition of the stomach forbid the administration of the sulphate of quinia by the mouth, it may be administered in enemata, twice or thrice the ordinary dose being given. It is sometimes, also, used endermically, from four to eight grains being sprinkled, or applied in the form of ointment, on a blistered part, once or oftener in the day. Cases of the successful treatment of intermittents by coating blistered surfaces with a strong ointment have been published; and others, in which the ointment has been rubbed successfully on the groins and armpits three or four times a day.

Various preparations of quinia, besides the sulphate, have been prescribed,—for example, the acetate, the citrate, the ferrocyanate, the muriatic, the nitrate, and the phosphate; but they possess no advantages over it. (*New Remedies*, 4th edit., art. *Quiniæ Sulphas*.)]

Arsenical solution is the anti-periodic medicine on which, next to quinine, the most reliance may be placed. An extensive experience leads the writer to give it a general preference over crude bark; but he thinks it inferior to quinine, though under certain circumstances it may supply the place of the latter valuable medicine advantageously. It has already been observed that it may be given in a more inflammatory state of the system than this medicine; and again, should an individual have been cured of ague by the sulphate of quinine or any preparation of bark, and have a relapse, it will often be found that the same medicine will not restore him to health, it having lost its power over the system by familiarity, and some other anti-periodic must be resorted to, especially arsenic. This loss of power by long continuance takes place with respect to all the anti-periodic medicines; and hence arises an advantage from having several, that one of these medicines may be substituted for another which has lost its influence. The one we are now considering, arsenical solution, the writer has given in many hundreds of cases, and has never seen any permanently ill effect but a little nausea and griping, which a diminution of the dose, or the addition to each of a few drops of laudanum, speedily corrected. The dose in which it is generally given is from five to twelve drops every four or six hours during the intermission.

[In the winter of 1843-4, the writer presented to the clinical class of the Philadelphia Hospital several cases of quotidians and double quotidians, which were permanently cured by sulphate of quinia used simultaneously with arsenic, after they had resisted the former. (*Med. Examiner*, Feb. 10, 1844, p. 28.)

The ferro-cyanuret of iron has been much extolled by many practitioners. Dr. Stokes (*Lectures on the Theory and Practice of Physic*, first Amer. edit., p. 349: Philad. 1837,) places quinia first, Fowler's solution second, and ferrocyanuret of iron third in the scale of value. In the writer's experience, however, it is very far inferior to cinchona and the other vegetable anti-periodics.]

The sulphate of zinc stands next in the order of power among these medicines. The best mode of administering it is in pills composed of the salt, powdered ginger, and conserve, each pill containing three grains of the sulphate; and of these, two may be given three times a day during the intermission, the number being increased to three and subsequently to four, which are as many as the stomach can bear. It is advisable to avoid drinking immediately after them, as it is apt to induce vomiting.

Various bitters, and combinations of them with aromatics, have been tried, and occasionally have proved successful. Quassia alone, or combined with some agreeable aromatic, is the most efficacious of them; but all are inferior to the anti-periodics previously mentioned. [The bark of Cornus Florida, C. sericea, and C. circinata; of Liriodendron tulipifera; of Aristolochia Serpentaria, and of Æsculus Hippocastanum, at one time much employed, have nearly gone out of use.] An extract of the bark of the olive-tree (Olea Europea) has been employed lately in Spain and France, and M. Pallas (Reflexions sur l'Intermittence chez l'homme dans l'étât de santé et dans l'étât de maladie, Paris, 1830,) gives many cases of cures effected by its means. Salicina, the alkaloid of the willow-bark, has likewise been tried in France, and it is said with a success equal to that experienced from sulphate of quinine. We cannot give any opinion of the two last-mentioned remedies from observations of our own; but the statements of others lead us to think favourably of their merits.

[Piperin, obtained from the long and the black pepper; phloridzin, from the bark of the root of the apple-tree; and cetrarin, from cetraria Islandica, have also been recommended, but they are rarely employed. (*New Remedies*, edit. cit.)]

Treatment of the sequelæ of the disease.—An important remedy for all forms of such affections, and one without which other means prove but too often unavailing, is a change from the contaminated air in which the disease originated to a more healthy atmosphere; for it were to take a very partial and imperfect view of malaria to regard it merely as the cause of fever. It is a poison of the whole system generating various diseases, particularly of the abdominal viscera, and aggravating those which are existing, occasionally by the instrumentality of open attacks of intermittents, but not unfrequently by a slower and more insidious contamination of the frame.

We have considered these sequelæ under two forms, viz., the more complicated and dangerous one, in which the liver and other organs participate, and the simpler, in which the spleen, an indolent and, so far as we know, comparatively unimportant organ, is principally if not solely affected; and we shall observe the same order in our remarks on their treatment.

In cases of the former description, topical bleeding, which may be occasionally repeated, from the epigastric and right hypochondriac regions by means of leeches, and subsequently blistering the same parts, will probably be found serviceable. One or two full doses of calomel should be given with some smart purgative, and then mercury in the milder form of hydrargyrum cum cretâ or blue pill, should be administered with or without eccoprotic laxatives according to the state of the bowels. After this course has been continued for some time, and been for some time suspended, the nitro-muriatic bath, or sponging the abdomen with the nitro-muriatic solution, may be resorted to. The waters of Cheltenham and Harrowgate are found beneficial after the inflammatory action has been very thoroughly subdued by topical bleeding and mercury. Should dysentery be coexistent with the liver affection, Dover's powder should be conjoined with the mild mercurials; and leeches may be applied along the course of the colon, whilst anodyne, emollient or gently laxative enemata should be administered. If dropsy exist, the mercurials should be combined with squill; but these are cases which too often mock the best efforts of our art.

If the case be one in which the spleen only is affected, a general bleeding should be performed if the patient's strength admits it; and under all circumstances local bleeding from the left hypochondriac region should be employed and occasionally repeated; whilst counter-irritation from the same region by blisters, setons, or moxas, should be subsequently adopted. Purgatives which cause considerable exhalation from the mucous surface of the intestines, are valuable adjuvants to these measures; six or eight grains of compound extract of colocynth, with three or four of antimonial powder nightly, followed in the morning by a proportion of sulphate of magnesia, or other saline purgative, will answer the indication exceedingly well. The diet should be light and antiphlogistic. Should these means fail to subdue the disease, iodine will merit a trial. Mercury, so beneficial in most chronic inflammations, is rarely, if ever, of service in these cases.

[It has lately been maintained, that in cases of splenic hypertrophy which follows long-protracted intermittents, the same plan of management is appropriate as is demanded for the cure of the intermittent. (MM. Bally, Nonat and Piorry, in *La Lancette Française*, cited in *Med. Chir. Rev.*, July, 1840.) The sulphate of quinia, in ordinary doses, has been found highly efficacious, as well as the subcarbonate of iron, in full doses. Of late, strong testimony has been adduced in favour of very large doses of sulphate of quinia—from 12 to 80 grains and more in the twenty-four hours—the most obstinate cases having yielded to a continuance of this treatment for a few days. In most cases, the action of the quinia was aided by the previous abstraction of blood, by cupping or leeches, from the left hypochondrium. M. Levy, (*Gazette Méd.* No. xxii.) has seen dropsical effusions that not unfrequently supervene on neglected cases of splenic enlargement, yield readily to the sulphate in large doses. (*Bullet. Général de Therap.*, Nov. 30, 1837.)

The iodide of iron is a good preparation in such cases.]

2. COMPLICATED OR MALIGNANT INTERMITTENTS.—It is not easy to present a methodical view of diseases so multifarious and variable as these. Their basis is an intermittent, which may be of any of the usual types; but either from the very commencement, or shortly after the attack of ague, some important organ becomes affected with disease, generally of an inflammatory nature, which complicates the original disorder throughout its whole course, subsiding but not entirely ceasing during the intermission, and becoming dangerously aggravated during the paroxysm, when, and especially towards its close, death occurs should the case prove fatal. These intermittents are distinguished from those we have already considered by the complications in the latter being merely the result of their long continuance; whilst in the malignant ague they are a part, and the most important and dangerous part, of the disease almost from its commencement. From the other division of these diseases, which we have subsequently to notice, they are distinguished by the circumstance, that in masked intermittents the character of ague is entirely immerged in that of some other disease, occasionally an inflammatory one, more frequently affecting the nervous system, occurring periodically, but without any other mark of ague, excepting perhaps a very slight chill, not at all resembling the full shivering of intermittent.

Examples of dangerous complications of ague were once frequent in this country, when ague itself was a more common disease here than it now is, as we learn from the writings of Sydenham and Morton; and they are still occasionally met with, though very rarely in comparison with their former frequency, or their present prevalence in countries more marshy, and situated under warmer latitudes than our own. The Italian writers down to the present time are rich in observations illustrative of their prevalence and fatality, for many parts of that peninsula, particularly the vicinities of Rome and Sienna, are prolific of intermittents of the most pestilential character.

The brain and its membranes, the viscera of the abdomen and those of the thorax, are the seat of these complications, and in this order we shall consider them, premising that it is so usual for the organs of the different cavities to be simultaneously affected that the line of demarcation will not be very precise; and when we speak of ague complicated with disease of a set of organs, it will be understood merely that the prominent and dangerous symptoms are attributable to such disease, not that those viscera only are affected.

Affections of the Brain and its Membranes.—The affection of these organs sometimes takes place suddenly, without there having been any thing in the previous symptoms of the intermittent to indicate to the patient or his attendants that any peculiar danger was impending. Werlhoff relates that one evening he met a widow-lady in the street, who entreated him to visit her on the following day, as she expected her third paroxysm. He went according to appointment, and found her not only in a severe fit of ague, but in a state of complete immobility, and with the stertorous breathing of apoplexy. It was found impossible to arouse her; the pulse became more and more feeble, and she shortly expired. (Observationes de Febribus. Venet. 1764.) A similar case is related by Bailly. (Traité des Fiévres Intermittentes Simples et Pernicieuses.) Benoit Simonelli entered the hospital of Santo Spirito at Rome, on the 22d of July, 1822, labouring under tertian; on the twenty-third he had a slight paroxysm and took after it two ounces of bark; on the fourth, towards noon, he was walking in the ward and amusing himself with the other patients, when he was suddenly seized with a violent shivering, followed by high fever, during which he had convulsive contraction and flexion of the forearm on the arm, and complete coma, and in six hours he expired.

These are examples of fatality supervening rapidly on the first symptoms of malignancy, but it is not unusual for patients to pass through a succession of paroxysms, attended with convulsions and coma, alternating with intermissions, in which the convulsive movements disappear, and the patient is restored to comparative sensibility and intelligence; yet may he ultimately sink under the disease with all the symptoms of apoplexy, should the recurrence of the fits not be prevented. Independent of the complication, the paroxysms of malignant ague wear in all respects the ordinary character, commencing with fully formed rigor succeeded by intense heat, and this again, by sweat, in proportion to the copiousness of which is generally the completeness of the apyrexia. But we often see that when intermittent assumes the complicated and malignant form, the cessation of fever at the close of the paroxysms is less perfect than in mild ague; so that many cases which, from the mode in which the disease commenced and the periodical recurrence of rigors, are classed with intermittents, might, from the imperfection of the apyrexia, with equal propriety be referred to remittents. Indeed, it may be remarked of these two orders of diseases, that though the extreme points of the scale are readily distinguishable by the least practised eye, yet the intermediate degrees are so blended that it would be often difficult to say where intermission ceases and remission begins. It is usual too to find, that when the more intense symptoms of malignancy display themselves, the type vacillates; a disease, for instance, which had occurred at the tertian period, assumes the quotidian form, whilst the paroxysms of one originally quotidian are apt to be duplicated.

The symptoms distinctly referrible to the brain and its membranes are of two orders, those of spasm or convulsion, and those of oppression or coma. Of the former there is not merely the ordinary subsultus of fever, but well-marked convulsive movements, such as the rapid contraction of the flexor and extensor muscles of the forearm already mentioned, convulsive twitching of the fingers; occasionally tonic spasm of the same parts or of the lower extremities, so that the flexors and extensors being balanced, the members acquire a tetanic rigidity; firm clenching of the lower jaw, and violent rolling or distortion of the eyes. Should both sets of symptoms occur in the same patient, it will generally be found that those of convulsion precede in point of time, though ere the close of the disease they are found coexisting. The signs of diminished sensibility are stupor, from which it is difficult or impossible to rouse the patient; immobility; incapability of swallowing; eyelids wide open; pupils occasionally dilated, sometimes morbidly contracted; pulse sometimes strong and bounding, at others small and feeble, and stertorous breathing.

M. Lallemand would consider the first set of symptoms, those of convulsion, to arise from inflammation of the arachnoid membrane communicating irritation to a healthy brain, or, at least, to one retaining its functions to a certain extent; in the second he would suppose that inflammation of the cerebral substance itself existed. It is certain that convulsive movements are compatible and are indeed generally found co-existing with coma, more or less considerable; but the opinion of M. Lallemand is supported by the facts, that in those cases of comatose intermittent in which there are convulsive movements, the patient is still capable of being roused to a degree of attention and to display some share of sensibility; and that in cases of coma without convulsion, the marks of cerebral inflammation are more considerable than in those in which convulsions existed.

The appearances found in the dissection of these cases are—inflammation of the arachnoid coat, indicated by intense vascular congestion; effusion of serum between the arachnoid and the pia mater; adhesion between these tunics, so that they form but one thick membrane, into the tissue of which blood is effused, occasionally by granulations of the arachnoid, or by its being covered by a false membrane; inflammation of the brain, shown by the cortical substance being of a deep brown or reddish colour, of which the examiner becomes at once conscious if he have an opportunity of making a comparison with the brain of a patient who has died from some other disease, (Bailly, op. cit. p. 182); oozing of points of blood in great abundance from the medullary substance on its being incised, or softening of the organ, and effusion of serum in the ventricles and base of the skull.

These changes may be found coexisting with extensive lesions of the liver, stomach, intestines, or spleen, such as are met with in the examination of those dead from ague with abdominal complication, which we are now to consider.

Malignant Ague, with Abdominal Complication.—The symptoms found in this complication are great pain of the abdomen increased by pressure; pain of the loins; vomiting, sometimes uncontrollable, of matters generally bilious, frequently bloody; discharges from the bowels of the same bilious or bloody appearance, or insurmountable obstruction; great sense of internal heat; tongue dry, and of a yellow, brown, or bright red colour; urine scanty, high-coloured, and often jaundiced; occasionally yellowness of the conjunctiva and skin; ardent thirst; frequently hiccup; pulse occasionally full, more frequently small, sharp, and contracted, and towards the close of the disease, feeble and sunk; the heat of skin often very great in the early part of the disease, but after it has continued some time the temperature is low, with lividity of the extremities, and cases are occasionally met with of which great coldness, not merely of the extreme parts, but of the trunk of the body, is a prominent symptom, not only during the rigor but the whole course of the disease: delirium frequently takes place during the paroxysm, and if the disease continue, it may be further complicated with coma or convulsions, the marks of lesion of the brain or its membranes.

On examination after death, extensive lesions of the viscera of the abdomen are discovered, of which the following are of the most frequent occurrence. The mucous lining of the œsophagus towards its lower part is occasionally inflamed, has a granulated appearance, or has a false membrane adhering to it. That of the stomach is thickened and inflamed, being of a colour varying from rose to reddish brown, whilst its mucous follicles are inflamed and so elevated as to resemble a miliary eruption, the follicles having a diameter varying from half a line to a line and a half, and being perfectly smooth, without central aperture. The mucous lining of the intestines presents in general the same deep shade of colour as that of the stomach; the valvulæ conniventes are red and swollen, and there is occasionally, but not often, ulceration in the vicinity of the ileo-cæcal valve. The sanguineous injection is not always confined to the lining of the canal, but occasionally affects the muscular and peritoneal coats. Occasionally, and especially in cases in which the alvine discharges have been sanguineous, we find the mucous coat not merely inflamed, but completely impregnated with what appears to be extravasated blood. The liver is found so gorged with blood, that its parenchymatous structure is almost entirely lost, the whole organ being little more than a mass of extravasation, and so soft that when an attempt is made to raise it, it is torn in fragments by the hands. This softened state occasionally alternates in the same subject with a tuberculated and harder condition. The ductus choledochus is often thickened by inflammation, and the gall-bladder is occasionally inflamed and lined with fibro-albuminous concretion. The bile it contains is generally as thick and black as tar. The spleen, occasionally weighing six or eight pounds, sometimes of its ordinary volume, resembles a capsule containing blood or a greyish pulp. When the peritoneal surface of the intestines is inflamed, the omentum is generally dark and vascular.

Ague with Thoracic Complication.—This species of complication is more rare than the abdominal and cerebral affections; but in the intermittents of temperate climates it often occurs, and in them probably rivals, if it does not exceed in frequency, the disorders of the viscera of the other cavities. It may display itself in the form of bronchitis, of inflammation of the pulmonary tissue, or of pleuritis. It is probable that a congested state of the mucous lining of the bronchi, closely allied to inflammation, exists in very many cases, perhaps in all, during the cold fit and the short and anxious respiration which attends it; for the stethoscope has made manifest a strong sonorous *râle* in this stage, which has totally disappeared on the breaking out of perspiration. A similar remark may be made respecting the pulmonary tissue — the congested state of the lung which exists in the cold stage of ague is, as Dr. Stokes has intimated, (Edin. Med. and Surg. Journ. vol. xxxi.) closely allied to the first stage of pneumonia; but we should not consider ague to be complicated with either bronchitis or pneumonia, unless the symptoms of one or the other of these affections were persistent through all the stages of the disease, and perceptible in the intermission; though it will be readily understood that these, like other inflammatory complications, must receive considerable increments during the vascular disturbance which attends the paroxysm, and that their general intensity will be increased by each successive fit.

We need not dwell on the phenomena which will be displayed by this complication, it being sufficient to remark that they are those of ague combined with the symptoms of pulmonary catarrh, pneumonia, or pleuritis. In cases of fatality, the lesions of tissue customary in the latter diseases will be discovered, with probably some marks of disease in the viscera of the abdomen, the affections of which it is so usual to find associated with all the other complications of ague.

Treatment.—The indications of cure are, to subdue the local affection, and to prevent the recurrence of the paroxysms, each of which, as has been explained, adds to its intensity. But we must not expect, in endeavouring to accomplish the first object, that the general system will bear those full depletory measures which are required by an idiopathic local inflammation. Rarely can we proceed beyond one general bleeding, and the topical detraction of blood by cupping or leeches, in our antiphlogistic treatment. The rule furnished long ago by Sydenham for our guidance in the management of epidemics in general, admits of very important application to the treatment of malignant intermittent, that we should endeavour to seize the genius or character of the prevailing disorder, and regulate our measures accordingly; for certain agues—those of some climates, and of different seasons of the same climate — are found to bear depletion better than others. It need scarcely be remarked that our local means should be directed to the head, thorax, or abdomen, according as the viscera of one or other of these cavities is the seat of topical lesion, and, consequently, the source of danger. Blisters to the nape in head-affections, and to the thorax and abdomen when they are the seats of disease, should not be neglected. Calomel should be freely administered, especially where the complication is situated in the head or the abdomen; and in the latter case, should the irritability of the stomach induce vomiting, opium should be conjoined with it. Emetics are rarely admissible, for they will tend to aggravate muco-gastritis, which is so frequent a complication, that perhaps no malignant form of the disease is free from a degree of it.

Whilst these measures are proceeding, or after they have been employed for a short time, antiperiodics, especially the sulphate of quinine, should be administered. If the symptoms permitted delay, it might be advisable in every case to abate the local affection by bleeding, general and topical, and by blisters and mercurials, previously to their exhibition; but in many cases we are under the necessity of deviating from this more scientific plan, and of endeavouring to prevent paroxysms, from which much danger is apprehended, by their early employment. An experienced French writer, M. Pallas, recommends that, in cases of gastro-intestinal irritation, each dose of quinine, the antiperiodic he recommends, should be conjoined with a grain of the watery extract of opium. If we succeed in stopping the recurrence of the paroxysms, the local affection, which owed much of its intensity to the increase that took place at every fit, frequently subsides easily without leaving any dangerous lesion of structure; but in other cases it must be acknowledged, though the paroxysms are suspended, the disease proceeds in its fatal course under a complicated continued form. It will be readily understood, as we employ quinine or other anti-periodic medicines for the object of suspending the paroxysms, and not on account of their tonic powers, and as topical antiphlogistic remedies may with propriety accompany such an employment of them, that the diet and general regimen of the patient should, with the exception of those cases in which there is morbid coldness throughout the disease, be perfectly unstimulating.

Proximate Cause or Nature of Ague.—We now reach the most difficult point, that of deciding upon the precise nature of those changes effected in the system by malaria, of which the symptoms of ague are the signs. Of these changes two views are taken, each by a different set of pathologists, similar to those entertained by them respectively of continued fevers. By the one party, the localists, a paroxysm of ague is deemed the sign of an intermitting local inflammation; whilst by the other it is thought to be a fever,—an abstraction if you will,—which is known by certain signs, but with the intimate nature of which we are not fully acquainted; and of which, though it is acknowledged that topical inflammation may accompany or complicate it, such inflammation is not thought to be the very essence and the cause of all its phenomena. We shall present the reader with a brief view of the facts which have furnished arms to the advocates of the respective opinions, with little more of commentary on our own part than is necessary to their being fully understood; leaving him to form the conclusion in a matter, which, now that there is no dispute respecting the treatment of the disease, may be considered rather speculative than practical.

The opponents of the first opinion, that of the localists, remark, that though sanguineous congestions unquestionably exist during the paroxysm of intermittent, and cease at its close, yet it is not easy to conceive actual inflammation, with its general thickening and lesion of tissue, as being thus fugacious. Sanguineous distention is an essential part of inflammation; but if we consider it as constituting the whole of that state, the distinction between congestion and inflammation is at an end, and it would perhaps not be very easy to draw the line between the latter and the occasional condition of the erectile tissue. Besides, if we regard the lesions which are discovered in fatal ague, of which so full an account has been given in the preceding pages, it will be impossible to conceive that such extensive disorganizations should have been produced during the last and fatal paroxysm. It will be evident that the inflammation which operated such changes must have been existing in the parts for a considerable period, and consequently, that intermitting symptoms ought not to be ascribed to this permanent cause.

The localists appeal from the reasonings of their opponents on the necessary fixity or permanence of inflammation for a period longer than the duration of a fit of ague, to examples of external inflammations, such as ophthalmias and cutaneous affections, of which many are to be found in authors, and particularly in the work of M. Mongellaz. (Essai sur les Irritations Intermittentes.) If these cases are carefully examined, it will be acknowledged that almost all of them are rather examples of the aggravation of inflammation during a paroxysm of ague, than of actual intermitting inflammations. But it must be allowed that all do not appear to be instances of the former description; but that some cases are mentioned which lead us at least to doubt of the necessary permanence of inflammation during a considerable period. As good an example of this kind as is perhaps to be met with, is given in the lectures of Dr. Elliotson, published in the Medical Gazette, in which the bites of leeches which had been applied to the abdomen on account of a diarrhœa with some tenderness there, became itching and tingling, and red at a certain hour every evening, the patient, a boy, becoming at the same time excited and feverish. There was reason to think that he had been exposed to the influence of malaria, and he was cured by quinine. Allowing a certain degree of force to these cases, we may still be permitted to remark that it is one thing to prove that inflammation may be a fugacious and intermitting affection, and another to show that the phenomena of simple ague arise from an inflammation of this kind, existing we know not where, and disappearing and recurring at intervals; though certain French pathologists, it is true, assure us, but on not very sufficient grounds, that it is seated in the gastro-enteric mucous lining; and it may, besides, be observed that these recurrent external inflammations, if there be no other disease existing in the system, do not produce the perfectly formed symptoms of a fit of ague. From the facts stated respecting the inflammations which attend ague, it appears that the doctrine of the localists requires a more ample and impartial investigation than it has yet received, and the consideration how far a permanent inflammation may manifest its existence only at intervals and periodically, and by the phenomena of a fit of ague, should form an important part of such investigation. The extreme feeling of debility, the pain and giddiness of the head, the aching of the loins, a certain degree of obscuration of the intellectual faculties, and the intense coldness of the surface, favour the opinion that the nervous system is the part primarily instrumental in producing the general symptoms; but how far it is impressed by some local lesion lurking in the frame, remains still to be proved.

Intermittence is, so far as we yet know, an ultimate or unexplained pathological fact. Speculative attempts at its explanation have been offered to the public, and we shall present the reader with that of M. Bailly, because it is founded in some degree on induction from facts, and possesses much more ingenuity than any other, though we acknowledge that it leaves unexplained phenomena, which, if it were successful, it ought to embrace, and reposes in part on an assumption which requires proof. M. Bailly first observes that in situations and seasons in which intermittents affect the human species epidemically, epizootics reign among the lower animals, of which he cites numerous examples; but, however their symptoms may vary in other respects, in one point they all agree, that of being strictly continued—intermittence being never observed in the diseases of brutes. M. Bailly then remarks that in the mode in which the actions of life are performed, we differ in one sole circumstance from domestic animals; and in this he conceives that the explanation of the occurrence of intermittents in the human subject is to be found. Animals preserve, during the whole of their existence, sleeping or waking, in all the acts of life, the same horizontal position, and consequently the heart, abdominal viscera, and brain retain the same situation relatively to each other; but man, on the contrary, changes from the vertical to the horizontal position, and consequently in him each nycthemeron (period of one night and day) consists of a succession of excitations or sanguineous congestions, which are felt according as he is in the erect or horizontal position, and according as these organs change their situation relatively to the heart, in the abdominal viscera or the brain. These varying congestions of course constitute the physiological or healthful condition of the generality of persons; but (argues our author) every pathological or morbid state is but the exaggeration of a physiological or natural one. The sanguineous congestion of the digestive organs displays itself in a degree which may be considered morbid in females or other delicate persons, who are either sick on first assuming the erect posture in a morning, or feel a total inaptitude for any occupation till they have taken food; and is well illustrated by that febricula, first described by Rœderer and Wagler, which may be said to constitute the habitual state of many literary and other sedentary persons. This slight disorder manifests itself simply by burning heat of the skin, with little acceleration of the pulse, and during it the patient pursues his accustomed avocations. At night he is either hot and sleepless, or is in a profound but painful and agitated sleep, and in either case feels unrefreshed in the morning; but if he remain in bed, the skin becomes soft, moisture is felt on the surface, in fact a sort of crisis takes place, and he feels tolerably well on the following day; but if he rise before this light sweating stage may have occurred, he remains all that day with a hot and dry skin, his countenance wears an expression of fatigue, his mouth is dry, his limbs are feeble, he feels oppressed, and without having any decided indications of disease, feels equally incapable of thought and action. M. Bailly supposes that this disorder is gastro-enteritic irritation produced by the erect position acting on a delicate and sensitive frame; that the horizontal posture diminishes it, and that if the patient remain so long in this posture as to bring this irritation to the lowest point, the functions of the skin are then restored, and the indisposition is removed temporarily by crisis. MM. Rœderer and Wagler have observed that nothing tends so much to the production of intermittent fever in this delicate class of persons as the suppression of these morning perspirations.

What has been described above, which is in some degree pathological, is but an excess of what exists in all individuals, and intermittent fever is but a further grade of such excess, or, as Bailly expresses it, is the exaggeration of that assemblage of organic acts which complete a nycthemeron, and which takes place in the following manner:—1st, morning congestion of the stomach and intestines; 2d, augmentation of the different nervous influences which it produces throughout the system, and which according to the particular disposition of the individual gives rise to one set of nervous symptoms rather than another, or which excites that part of the nervous system which penetrates all our organs accompanied by blood-vessels when intermittent fever takes place; 3d, cessation of this congestion by the horizontal position.

It would be unjust to deny the ingenuity of all this, which has received much more illustration from its author than we can transfer to our pages; but it must be remarked that it proceeds on the supposition that the cause of ague exists in the digestive canal, which in the present state of our knowledge of the subject can be considered as little more than a postulate, and whilst it provides an explanation for quotidian intermittent, leaves tertians and quartans unexplained, which are considerable lacunæ in the hypothesis. Other speculations have been offered to the world, one, for instance, by M. Roche, who says that intermitting fevers arise from intermitting causes. These prevail in spring and autumn, when there is a great difference between the temperature of day and night, and when in a few hours there are sudden alternations from great heat to comparative cold; the malaria, too, which is generated is intermitting in its operation, for that which is produced in the middle of the day is so diffused by the rising of the heated air which is impregnated with it, that it does not act, but when concentrated in the condensed and chill air near the surface of the earth, cooled by radiation during night, it is in a state fit to produce its effect on the system. Did each paroxysm require for its production the application of cold or malaria, and were it in the instantaneous effect of such application, there might be some foundation for this hypothesis; but when it is considered, (even granting what is by no means proved, that malaria acts only at night,) that a considerable period generally elapses between the first exposure to the action of the poison and the appearance of the disease, that indeed there must be such an interval if the poison is to act intermittingly or by a succession of nightly applications, then it becomes manifest that to assume that the disease must imitate the preceding movements of its cause is the most entraordinary *non sequitur* that ever entered into the mind of man. This becomes still more manifest when we reflect that one single exposure to malaria will produce, days or weeks after, an attack of ague which shall last for weeks or months; as is often exemplified in the case of sailors sleeping one night on shore; and happened to a friend of the writer from resting, when travelling, for a few hours in a marshy situation where ague was prevailing.

3. Masked Intermittents.—These [often termed by the vulgar *dumb agues*,] may be succinctly described to be certain diseases familiar in a continued form to medical men and our nosologies, recurring at intervals in paroxysms of greater or less duration, when thus periodical apparently owing their origin to the influence of malaria, and remediable by the means employed to cure intermittent fever.

It were no easy matter to give a detailed account of all the diseases which have been observed under this intermitting form; to name those which have been remarked by authors to put on this character will be sufficient to make the profession aware that, whilst malaria is in operation, they must not expect all the diseases which are the result of it to assume the regular form of ague, but that such curious and anomalous disorders as those of which we are about to furnish them with little more than a list, will fall under their observation, and will require for their cure a treatment different from that of their continued type.

These diseases are either inflammatory or nervous. Of the first class there have been mentioned examples of pneumonia, (*Pallas*, Réflexions sur l'Intermittence); pleuritis, tertian, (*Sauvages*, *Arloing*); carditis, (Ibid, et *Juncker*); otitis, (*Mongellaz* and others); (peritonitis fell under the writer's own observation); ophthalmia, frequent; coryza, frequent; tertian swelling of the head, (*Mongellaz*); quotidian and tertian urticaria, (Ibid.); quotidian scarlatina; livid spots, probably of purpura, quotidian, (*Storck*); tertian erysipelas, (*Mongellaz*); rheumatism, quotidian, tertian, and quartan, (Ibid. and others); gout, first quotidian, then double quartan; epistaxis, quotidian; intermittent odontalgia and cephalagia, very frequent; quotidian inflammation of leech-bites, (*Elliotson*, Lectures published in the Medical Gazette); encephalitis and meningitis, quotidian, tertian, and quartan, (*Leucaire*, *Parent du Chatelet*, *Martinet*, *Deslandes* and *Audouard*); gastro-enteritis, (*Havard*); diarrhœa, tertian (*Piequé*, Journal de Medecine, 1774,) and quotidian, frequent (from the writer's observation); and dysentery has not unfrequently been found complicating the paroxysms of an intermittent; but it may be questioned whether it have itself been met with as an independent intermitting disease meriting the name of a masked intermittent. Other intermitting inflammations are mentioned by authors, but on close scrutiny it will be found that many of these diseases have been permanent, and that the observers have not duly discriminated between a diminution of intensity and total intermittence.

Of the nervous affections the following are the most remarkable: asthma, frequent, but many cases which have occurred in the practice of the writer, lead him to suspect that the periodical exacerbation of permanent bronchitis has been occasionally confounded with intermitting dyspnœa; periodical hysteria and epilepsy, frequent; intermitting deafness, type tertian, (Ephemerides Curios. Naturæ, 1704); tertian convulsions and blindness, (Ibid. 1694); quotidian dumbness, (Ibid. 1684); periodical sneezing, three paroxysms occurring every evening, and each paroxysm comprising three hundred sneezes, (Ibid. 1672); tertian eructation, at the rate of three hundred eructations per hour, (Ibid. 1672); periodical flow of leucorrhœa, with lypothymia, convulsions, and mutism; intermitting palsy is mentioned by many, and an excellent example of intermitting hemiplegia of the left side is related in Dr. Elliotson's lectures published in the Medical Gazette. It was generally tertian or quartan, but once recurred at the interval of sixteen days.

But neuralgia is by far the most common form of masked intermittent, exceeding in frequency of occurrence, so far as the writer has had opportunities of observation, all the other forms of this disease collectively; and it may be questioned whether many cases, supposed to have been examples of the periodical recurrence of inflammatory disease, were any thing but a painful affection of the nerves of the part. The anterior tibial, occipital, and sciatic nerves have been observed to be the seats of quotidian, tertian, double tertian, or quartan neuralgia, (*Stoll*, *Carron*, *Audouard*). Many cases, commonly entitled spasmodic asthma, have been supposed by some to depend on the same disease situated in the pneumo-gastric nerves, and instances of intense periodical pain in the region of the heart, extending thence to the middle of the left biceps, with small and fluttering pulse, deadly paleness, and inability of making the slightest movement, which the writer strongly suspected to be the same affection seated in the cardiac nerves, and which were remedied by quinine and anodynes, have fallen under his observation. But the branches of the fifth pair of nerves are certainly more frequently than any other the parts affected by periodical neuralgia, and we shall describe the disease, when so situated, as the representative of all its forms. It prevails much in spring, particularly during the prevalence of strong easterly winds, affects most the quotidian or double tertian type, and the invasion of the paroxysm often takes place at ten or eleven in the morning, but occasionally at night, and sometimes as early as three in the morning. Its commencement is marked by a very slight chill, amounting perhaps to little more than some coldness of the hands and feet. Slight pain then begins to be felt either above the orbit only, or both in the forehead, over the cheek, and along the gums of the affected side. This speedily becomes agonizing, and is often attended with injection of the conjunctiva of the same side, lachrymation, abundant discharge from the corresponding nostril, and flushing of the cheek. This goes on for a period varying from four to six hours or longer, then subsides with slight moisture of the skin, and finally disappears totally, with the exception of a little soreness of the part which had been the seat of pain. During the paroxysm there is heat of surface, and the pulse becomes rapid and is increased in force. Throughout the disease the urine is high-coloured, and deposits a brickdust sediment; and the tongue is furred, till the state of the digestive organs is corrected by proper remedies.

Treatment.—The principles of treatment so fully explained under the head of simple intermittent, apply to masked ague, the anti-periodic remedies possessing the same power here as in the more usual forms of the disease, provided the intermission be perfect and the paroxysms recur periodically. In treating the neuralgic forms, it will generally be advisable first to correct the state of the digestive canal by mercurial alteratives and purgatives, and then to endeavour to prevent the recurrence of the paroxysms by the sulphate of quinine or arsenical solution. It may be remarked that we shall often find the latter remedy succeed where the former has failed, and inversely. Carbonate of iron, not accounted a remedy of common ague, has succeeded, when given in doses of a drachm every three hours, where both had been tried without effect, and a case fell under the writer's observation which yielded to powdered bark, after it had resisted the other means mentioned. It is often advisable, especially in the case of females, who are more frequently the subjects of this disease than the other sex, to add some preparation of opium or hyoscyamus to the anti-periodics; and in all cases it is proper to give a full opiate at the commencement of the paroxysm. Covering the parts which are the seat of pain with a plaster of the extract of belladonna frequently diminishes its intensity.

Any notice of those purely sympathetic intermitting paroxysms which are occasionally met with in affections of the urinary organs and in certain chronic visceral diseases, not in their origin at all associated with ague, would be misplaced in this article.

Joseph Brown.

FEVER MILK. (See Lactation.)

FEVER, REMITTENT.—This term is employed to designate a fever of which the symptoms undergo at intervals during its course a marked abatement or diminution, which is called a remission. Such a fever may be considered as holding a middle rank, as to external character, between intermittent and continued fevers; but with respect to its nature, the localities in which it chiefly prevails, and the cause whence it principally if not solely arises, it bears a closer affinity to the former than the latter. It may be regarded more properly as forming the mean degree in the scale of periodic or marsh fevers, of which intermittent and yellow fever constitute the extreme points. A more intense operation of the febrific cause than is required for the production of intermittent fever engenders remittent, and the more violent the latter the more remote is its character from that of intermittent; or, in other words, the less perceptible the remissions. That a more powerful action of the morbific cause is demanded for the production of remittent fever, is indicated by the circumstance that when periodic fevers are prevailing in certain countries, the permanent residents are often observed to have the disease in the form of ague only, and the mortality among them is small; but strangers unhabituated to the climate and its diseases, suffer from remittents, with a proportionably greater loss of life. In more sickly seasons remittents will be the prevailing form among both classes of persons, but strangers are more violently affected, and the mortality among them is greater. Its affinity to intermittent is shown, too, by the tendency which it has to pass into that form, and, inversely, by the proclivity of ague to assume the remitting type. (See INTERMITTENT FEVER.)

Remittent is the endemial fever of warm climates, especially of those of which the soil is marshy; but it is to be met with in the more temperate regions of the earth, and is not unfrequently observed in our own country, especially in seasons of unusual heat, and in those parts of it where under ordinary temperatures agues are prevalent. [The bilious fevers, as they are termed, belong to it.]

In all countries which it invades, this disease is more generally observed in autumn than in other seasons of the year; but it is not unfrequent in summer, and is occasionally seen in spring. The writer has witnessed it in this country in winter, but, from the feeling of indisposition which had long preceded the manifest attack of fever, he had no doubt that the cause was applied the preceding autumn.

Symptoms.—The disease sometimes occurs suddenly, but more frequently it is preceded by unpleasant sensations at the stomach, listlessness, headach, and watchfulness of some days' duration. Its actual invasion is indicated by a feeling of coldness of the extremities and back, and sometimes by general coldness and actual shivering. This sense of coldness speedily alternates with flushes of heat; the mouth at the same time is clammy or dry; there are considerable thirst, nausea, and occasionally vomiting; pains in the head, back, and limbs, with a hurried respiration; and frequent, small, and sometimes irregular pulse. To these symptoms succeeds a state of excitement, accompanied by a high degree of heat perceptible to the hand of the attendant as well as to the feelings of the patient; dry skin, violent and throbbing pain in the head, flushed countenance, a rapid, full, and forcible pulse, and sometimes delirium. The tongue is at the same time white and furred; there is generally some tenderness of the epigastrium, with nausea, and occasionally vomiting either of mere watery secretion or of bilious matter. The urine is high-coloured, the bowels are generally torpid, and the thirst is considerable.

In about twelve or fourteen hours, though sometimes not till nearly double this period has elapsed, there is a manifest remission of these symptoms; a moderate perspiration breaks out, the nausea and vomiting (if it has existed) cease, the pulse becomes softer and less frequent, the thirst abates, the heat of the surface is diminished, and the mental state becomes rational and tranquil; but there is by no means a total cessation of fever, and after a comparative calm of two or three hours' duration, there is a renewal of the more intense symptoms of excitement, occasionally preceded by chill or even rigor, but occasionally without such a precursor. After this the disease proceeds in its course, with remissions and exacerbations very variable in their degree and period of recurrence till about the seventh day, but in other cases till the fourteenth, when all the symptoms cease with a general and copious perspiration, and frequently an abundant eruption of herpes labialis.

The preceding sketch is drawn from examples of the mildest form of the disease, occurring in a warm climate, and in individuals of a vigorous constitution. It will be readily understood that the varieties arising from the different degrees of intensity in the usual cause, from circumstances which modify the action of this cause, and from peculiarities of individual constitution, must be so numerous, that the attempt to represent them all to the reader would be an insupportable tax on his attention and memory. We shall therefore present a picture taken from cases of the most aggravated form of the disease, leaving many intermediate degrees and varieties to be discerned clinically by the practitioner by the aid of some general observations on them, and the circumstances to which they owe their peculiarity.

This form, like the preceding, commences with a sense of coldness and sometimes with shivering, but in general the feeling of cold is rather long-continued than great in degree. It is followed by excruciating pain of the head, with a sense of tightness as if the skull, on a level with the upper part of the orbits, was firmly girt with a cord. The countenance becomes flushed, of a purple hue, agitated, and expressive of pain and anguish; the eyes are vascular and watery; the tongue is white, clammy and moist, or rough, dry, and brown; and pains are felt in the back and lower extremities, those in the latter resembling the sensations which attend the cramps of cholera. Nausea is an invariable symptom, and there is occasionally vomiting of viscid secretion; the intellect is confused, with short bursts at intervals of outrageous delirium, and the pulse is frequent, small, and contracted, and occasionally irregular. The skin is either dry, or, if moist, the moisture is of a nature which indicates rather intensity of suffering than energy of circulation; the heat of the surface on the first application of the hand is not found to be great; but on longer or firmer pressure the fingers perceive a tingling sensation, the *calor mordax* of writers; the bowels are either obstinately costive, or there are frequent, scanty, and loose stools; and the urinary secretion is either very much diminished or totally suspended.

After this state has endured about twelve hours, a remission takes place, the patient remaining very ill and feverish, yet with less suffering than before; but this tranquillity is of short duration, for in less than six hours in some cases, in twelve or fourteen in others, a slight chill is felt, and there is a renewal of the symptoms described in the last paragraph, with the additional circumstances of a sense of pain in the epigastrium, much increased on pressure; and irregular distribution of heat, the præcordia being excessively warm, whilst some other parts of the surface are cold; incessant restlessness and jactitation; hurried or laborious breathing, and such insensibility of the skin that blisters sear but do not vesicate. In fatal cases these symptoms endure in varying degrees of intensity, but with very imperfect remissions, from five to seven days. The approach of death is denoted by hiccup, distressing vomiting, hemorrhage from the intestinal canal, sinking of the pulse, muttering delirium, and coldness and lividity of the surface.

Recovery may be expected if the pulse becomes more full and expansive, the heat more equalized over the surface, the pain of the head and epigastrium less distressing, and if the countenance, though still flushed, loses the purple hue which it previously possessed. A favourable inference may be drawn, too, from the remissions becoming more distinct, the conjunctivæ being less vascular, the bowels more obedient to the action of purgatives, the restoration of a more abundant urinary secretion, and the appearance of bile in the matters vomited. These changes, which indicate relief from oppression, and restoration of natural secretion, with the continuance of open and safe vascular excitement, are generally the result of medical treatment. The mean duration of this form of fever, in cases of recovery, is about fourteen days.

The character of remittent fever is modified by the season in which it prevails. In spring, for example, it is more frequently associated with affection of the organs seated in the thoracic cavity, than with prominent cerebral or abdominal complication. In summer, during which season, in the climates which are most frequently visited by it, determinations of blood to the head are frequent from insolation, and even from the high degree of heat independent of exposure to the direct rays of the sun, the brain is the organ which presents the most marked symptoms of affection. The operation of this cause is frequently aided, especially among British troops in warm climates, by the abuse of fermented liquors and ardent spirits. In autumn an affection of the abdominal viscera constitutes the most prominent local affection, generally associated, it is true, with marks of disorder in the brain and its membranes; but it is prior to such disorder in time, and exceeds it in degree.

This disease, which is so rapid in its march under the ardent heat of tropical climates, when it appears in more temperate regions, for instance in our own country, runs a longer course than any fever, hectic excepted, with which we are acquainted; and its exacerbations and remissions are more distinct than in warmer climates, but exceedingly irregular in the period of their recurrence. The former are not unfrequently ushered in by rigors nearly as severe as those of ague, or by a very well-marked chill; and occasionally so complete a remission occurs as to deceive the attendant by inducing him to suppose the patient convalescent: it has appeared to the writer that this very considerable abatement in the intensity of the disease is most apt to take place at one of the septenary periods from its commencement, especially about the fourteenth or twenty-first day. The whole course of the fever is frequently of forty or fifty days' and occasionally of nine or ten weeks' duration. Its great length is often attributed to relapses, but in the majority of such instances which have fallen under the writer's observation, he has had reason to think that remission had been mistaken for convalescence. This fever is not uncommon in this country and other temperate climates in autumns of unusual warmth; and occasionally, too, it is observed in the beginning of winter, but the cause, it will be found, had been applied during the preceding season.

A striking peculiarity frequently to be observed in the mental state of patients labouring under remittent fever has received little attention from authors, having been noticed only by the late Dr. Jackson, (Sketch of Febrile Diseases, by Robert Jackson, M. D. p. 123, et seq. London, 1817); and in a work published some time ago by the writer of this article. (Medical Essays, by Joseph Brown, M. D. p. 48, et seq. London, 1828.) Instead of the ordinary form of febrile delirium, in which the mind appears occupied with a crowd of unconnected ideas, and quite abstracted from surrounding objects, it in this case retains all its acuteness of perception and vigour of reasoning; but there is one erroneous impression so firmly fixed in it that no argument can shake it, and it is frequently of so gloomy a cast as to impel its victim almost irresistibly to suicide. To accomplish this object, (and in too many cases which fell under the writer's observation it was accomplished,) the patient will often display all the cunning of a monomaniac. In many cases the impression was that of being causelessly abandoned to the scorn of the world; and in others, of a disgraceful imputation having been fixed upon the character, of the falsehood of which no proof could be obtained. Dr. Jackson relates a case in which the patient, in the exacerbation of a remittent, believed he was to be hanged for stealing coals; during the remission the illusion ceased; but it recurred with the succeeding paroxysm, and he then declared himself resigned to his fate, and thankful for the respite of the preceding day, that of the remission. It is scarcely necessary to remark that the crime for which he supposed he was to suffer was as imaginary as the punishment which awaited it. During this mental derangement, — an appropriate term, for it has the characters of derangement, not those of delirium, — the patient, so far from there being any general obscuration of the intellect, often displays a self-possession and an acuteness of the mind above the ordinary level of his character. This peculiar state is not often observed in cases of the disease which are physically bad ones, nor is it confined to the advanced stage, when the mental as well as the bodily powers might be supposed to be enfeebled; but it exists from an early period, and is perfectly consistent with a considerable degree of general strength. It is more frequently observed among persons of the upper walks of life and of education, than among those of inferior station and attainments: the officers of the army in Spain, for instance, were more frequently the subjects of it than the soldiers, and it often fell to the writer's lot to see medical officers suffering under it.

No decided peculiarity has been detected in the symptoms during life, or the structural changes discoverable after death, to explain the striking discrepancy from the ordinary form of delirium which occurs in these cases. In all of them the has been evident derangement of the digestive canal, and its subsidiary viscera; and this derangement, in general so apt to produce mental despondency, is acting on a sensorium enfeebled and irritated by fever; but the same circumstances exist in other cases in which there is either no aberration of mind, or in which, if it exists, it assumes the ordinary febrile form. We are therefore compelled to suppose that some peculiarity of individual constitution co-operates with the disease in engendering this unusual form of delirium; but there is considerable difficulty in discovering in what this individual peculiarity consists. A tendency to actual insanity will not explain it, for delirium has borne this appearance in individuals who have at no other period of their lives manifested any indications of that malady, and the mental illusions always cease on the subsidence of the fever. As it is more frequently observed in intellectual and educated persons than in those of a different class, perhaps mere sensitiveness will explain it; but the subject is involved in much obscurity.

Another form of mental affection not uncommon in this fever, is an indelible impression on the mind of the patient of the necessary fatality of the disease, though there may be nothing in its physical symptoms to excite the apprehension of the attendant. We know not whether this can be considered as a mental illusion or not, for in every case which has fallen under our observation the patient's prediction has been fulfilled, and we feel in doubt whether the mental impression was instrumental in the accomplishment, or whether it did not itself proceed from some deadly feeling of the patient which language could not express, and of which the cause did not display itself by manifest signs. Dissection has thrown no light on this point.

Certain disorders are found to follow remittent fever. Of these, diarrhœa and dysentery are most frequently observed, and it may often be remarked that one or other of these disorders, especially the former, prevails simultaneously with it, and an attack of either of them appears to be equivalent to one of fever, those who suffer from the one escaping the other. Occasionally, too, an attack of bowel-complaint, accompanied with constitutional disorder, precedes the invasion of remittent, and passes so insensibly into it, that the attendant is at a loss to say at what precise time the fever commenced. Dropsy is a frequent sequel of this fever, especially of the cases complicated or followed by diarrhœa. In cases in which the head has been much affected by the disease, the mind, during convalescence, betrays a degree of feebleness almost approaching to idiocy, from which recovery is very slow.

Appearances on Dissection.—The changes of structure discovered in fatal cases of this disease resemble so much, or rather are so identical with those observed in complicated and malignant intermittent, of which a full account is given in the preceding article, that a brief narration here, and a reference to that article, will furnish the reader with ample information on the subject.

In the head are observed, vascularity of the membranes of the brain, and effusion of serum or gelatinous fluid between them; fluid in the ventricles in greater quantity than is ordinarily observed, and oozing of blood on cutting the hemispheres transversely; but it must be remarked, that occasionally death, preceded by delirium or coma, takes place, and yet no morbid appearance of the brain or its membranes can be discovered; and we may go further, and state that cases have terminated fatally, and, on examination by acute and experienced observers, no structural change of any organ has been detected; though it must be acknowledged that such cases are so rare as to constitute the exception, not the rule.

In the chest, adhesions and serous effusion are occasionally discovered between the pleuræ and in the pericardium; the bronchial lining is frequently unusually vascular, and the parenchyma of the lungs is congested or inflamed. These changes are most discernible in vernal remittents. On examining the abdomen there are found inflammation and sometimes ulceration of the lining of the digestive canal, with occasionally an effusion of blood between the mucous and subjacent coat. The liver and spleen are often enlarged, and unusually soft; and the urinary bladder is occasionally contracted in size, and has its mucous lining studded with clots of blood.

The question of the nature of periodic fever having been discussed at some length in the article on intermittent, to examine how far these pathological states are strictly essential to the disease, or are to be regarded as mere concomitants or effects, would inevitably lead to a repetition of the arguments employed in that article, which we are desirous of avoiding. British writers on remittent fever have generally confined themselves to the relation of facts, and in their works it has generally been implied, if not positively stated, that this fever, like others, is a condition distinct from inflammation, but very generally associated with it, and that this association should receive full attention in the treatment. The French writers assume a more decided tone, and a numerous class of them, proceeding from the postulate that every fever commonly considered essential or primary is but a symptom of a local inflammation, regard periodic fevers as mere indications of intermitting or remitting phlegmasiæ. M. Rayer's doctrine is different from this. According to his views, intermittent fever is a cerebro-spinal neurosis, and remittent fever he degrades from the rank of a disease capable of nosological classification to that of "various complications of intermittent fever with other disorders." (Dictionnaire de Médecine.)

Treatment.—This, as in the case of most fevers, must vary so much according to the various circumstances of the disease, that it is impossible to lay down rules with respect to the employment of any remedy which shall not admit numerous exceptions.

General bloodletting, in attacks of the more ardent forms of remittent, may be employed freely at the commencement of the disease, and its repetition may be speedily required in such cases, if the force of the circulation is not diminished by the first bleeding, and especially if there are indications of cerebral affection; and even in the more sunk and depressed forms, one bleeding at the commencement relieves the system, and, aided by the warm bath and other remedies, conduces materially to the safety of the patient. Good effects are occasionally obtained in the latter description of cases, by drawing the blood whilst the patient is in the warm bath; but we should be more sparing in quantity than in attacks of a more ardent disease. In the more protracted disease of temperate climates, it will rarely be advisable to perform more than one general bleeding, and even this in delicate subjects may be frequently dispensed with.

Free local bleeding, by cupping or leeches, from the vicinity of organs affected with inflammation, is always safe at the commencement of remittent, and may be often performed with advantage at a late stage.

Purgatives, so administered as to unload the bowels without needlessly irritating them, are valuable remedies. Pills of calomel, with a proportion of extract of colocynth, powdered rhubarb or jalap, followed by a solution of neutral salts, answer the purpose exceedingly well.

In the more intense and excited variety of the disease, cold effusion may be employed during the exacerbation with great benefit; in milder cases, cold sponging at intervals during the same period will accomplish our object with less shock to the feelings of the patient.

Cooling, acidulated drinks, and draughts with liquor ammoniæ acetatis, or the ordinary saline draughts, tend to allay thirst, and, on the whole, to diminish the degree of excitement. There is so great a tendency to vomiting in this disease, and if excited it is so difficult to subdue it, that antimonials are not suitable remedies.

The local affections which manifest themselves during the course of the disorder require attention. If there be much pain of the head, with or without delirium, besides bleeding by leeches from the temples, the scalp should be shaved and kept incessantly cool by sponging with cold water, or the constant application of wet cloths. Vomiting, which is a very distressing symptom, is most effectually relieved by the application of leeches and hot fomentations to the epigastrium, followed by a blister and the internal employment of some preparation of opium, for which the ordinary effervescing draught furnishes a convenient vehicle. Should diarrhœa exist, leeches, and subsequently a blister to the umbilical region, unloading the bowels with castor oil, and afterwards the employment of hydrargyrum cum cretâ with Dover's powder, will be found to be its most suitable remedies.

Independently of its effect in relieving vomiting or diarrhœa, opium is a valuable remedy in the advanced stage of the disease, to allay irritation and procure sleep. Mercury is of use as a purgative, and as a means of correcting the morbid secretions and condition of the intestinal canal, and the organs associated with it; but the attempt to supersede the febrile action in remittent by bringing on that of mercury we have never seen successful. It is true that on the subsidence of the fever, ptyalism takes place, and is often exceedingly injurious to the patient; but there is never reason to think it instrumental in producing convalescence.

We are recommended by some writers to attempt to cut short the disease by the administration of bark, arsenic, or other anti-periodic remedies as in intermittent; but the remission must be so perfect as to amount to an actual apyrexia, and the disease must, therefore, become identified with intermittent, before such a plan can be attempted with propriety; for we have almost uniformly observed that the employment of any anti-periodic in actual remittent not only failed in its object, but has invested the disease with a more continued and dangerous character.

The diet at the commencement of the disease should consist of the lightest and most cooling diluents, such as tea, tamarind-water, lemonade, &c.; but in the advanced stage more nutritious matters, sago, arrow-root, panado, chicken-broth, and even a little wine may be allowed. In some of the more sunk and oppressed forms, it may be advisable to give wine or other stimulants cautiously at an early period.

As soon as the patient's state will admit of his being removed, it is advisable that he should, if possible, quit the district in which the disease has been generated.

JOSEPH BROWN.

[FEVER, MALIGNANT REMITTENT.—Remittent fever appears in certain localities and seasons with a more malignant aspect,—most, if not all, of the cases presenting phenomena characterized by marked adynamia and ataxia. In many parts of this country, and in the most unhealthy regions of the torrid zone, remittents are often extremely violent and malignant from the outset. The cold stage is generally of brief duration, the succeeding fever very violent, and accompanied by excruciating headach, pain in the back and limbs, anxiety, dyspnœa, and a distressing feeling of weight and oppression at the epigastrium; these symptoms usually continuing for about twenty-four hours, when a remission, often amounting almost to an intermission, occurs, which is not, however, of long duration. A second paroxysm supervenes of greater severity than the first, which terminates sooner or later with a clammy perspiration—great oppression at the epigastrium being present. The paroxysm recurs, if the disease be left to itself; but not uncommonly death takes place in the third paroxysm. If the disease continues, however, great prostration frequently occurs with all the symptoms that are characteristic of highly adynamic fever.

The more malignant forms are often *congestive*, and hence the name given to them in many parts of the United States, where they occasionally prevail most destructively. In these varieties, the accession of symptoms of debility; oppressed respiration; small, weak pulse; anxiety; prolonged perspirations; faintness; cold, livid extremities, &c., set in early; and the disease is often alarmingly fatal, so as to have acquired, in the southern parts of the Union, the name of *cold plague* — a name, which has also been given to the worst forms of typhus.

Malignant remittent is very apt to be complicated with organic mischief in the alimentary canal, liver or brain, which is announced by the phenomena denoting subacute gastritis, hepatitis, or encephalitis. Occasionally, too, the bronchial tubes participate in the morbid condition. Fatal cases arise from these local lesions, but death may occur, as in other febrile affections, in consequence of the patient being worn out by irritation.

The lesions, met with in those who have died from remittent fever, are various. At times there are evidences of hyperæmia, and inflammation of the lining membrane of the stomach and intestines, and of the follicles there situate. An accurate observer, Dr. Stewardson, of Philadelphia, found on the examination of those who died under his charge at the Pennsylvania Hospital, during the years 1838, 1839, and 1842, lesions of the spleen and liver in every case, and development of the glands of Brunner in the duodenum; and he considers, that the frequent enlargement and uniform distinctness of these constituted a striking peculiarity of the disease. The stomach, likewise, was very frequently inflamed. In the cases observed by him, the essential anatomical characteristic of the disease appeared to be the morbid condition of the liver, which was found to be flabby, of a bronze colour, with the two substances that enter into the constitution of the organ so blended together as to be scarcely distinguishable. The spleen was much enlarged and softened. (*Amer. Journal of the Medical Sciences*, April, 1841, and April, 1842; and Stewardson's edit. of Elliotson's *Principles and Practice of Medicine*, p. 338: Philad. 1844.)

In the remittent fevers of India, according to Mr. Twining, (*Clinical Illustrations of the more important Diseases of Bengal*, &c. Calcutta, 1832,) the brain and stomach seem, at times, to be almost exclusively affected; in other cases, the spleen, intestines and lungs; and in others the liver.

In the fatal African remittent fever of 1841-2, described by Drs. M'William and Pritchett, (reviewed in *Amer. Journ. of the Medical Sciences*, for April, 1844,) the morbid appearances were not uniform. The colour of the liver is stated to have been grey or pale—certainly anæmic.

As elsewhere remarked, (*Practice of Medicine*, 2d edit. ii. 451,) the appearances, presented on the examination of those who have died of remittent fever, must differ almost *ad infinitum*. In diseases attended with so much irregularity of the functions of innervation and circulation, and implicating the whole system, there is scarcely an organ which may not give evidences of hyperæmia, if not of active inflammation.

Treatment.—In the severe remittents of the southern parts of this country, the gastric complication is usually so urgent, that emetics or cathartics would be inadmissible, should they seem, from other considerations, to be indicated. Bloodletting, practised early, has been found to check the excessive irritability of the stomach at once.—When employed, however, it must be done early. Afterwards, should the irritability continue, sinapisms may be applied to the epigastrium; with the internal use of ice, ice-cold soda-water, and the other means that are usually found to check vomiting. In the malignant forms of intermittents, bloodletting, if proper at all, can only be so at the very onset; but where doubts exist as to the propriety of practising it, there may be none as regards the application of leeches to the epigastrium, or to the temples if the head be much affected. Both in this country and in India, calomel is generally administered freely, to induce a new action in the system, and thus to break in upon the morbid chain already existing. Twenty grains are often given every three or four hours, and repeated until either the gums exhibit its influence, or the evacuations become manifestly bilious; and, along with this, the ordinary refrigerants recommended in fever are prescribed.

In all cases, it is important to take advantage of the earliest remissions; and to administer the sulphate of quinia freely. This course has been found highly successful in malignant remittent as it has prevailed in the southern and western parts of this country. In the congestive fever of the western states, after re-action has been established, the sulphate of quinia is considered by one writer as "the remedy,"—"the master-article of the materia medica:" (Dr. C. Parry, in *Amer. Journ. of the Medical Sciences*, 1843.)

The dietetic treatment throughout the disease must be that of febrile diseases in general; and when adynamia is considerable, it must be met in the same manner as where it supervenes in other febrile diseases—always bearing in mind the great tendency of malignant intermittent to induce hyperæmia and serious mischief in some internal and important organ.

Robley Dunglison.]

FEVER, INFANTILE REMITTENT.— By infantile remittent is now commonly understood a species of fever to which children, from one year old up to ten or twelve, are very subject, characterized by one or more daily exacerbations and remissions, by pain of the belly and sometimes also of the head, and by an unnatural state of the alvine discharges. This, in the language of the older writers, from its supposed but imaginary cause, was usually denominated a worm fever.

In the last century, indeed, many epidemics, even of adults, were thought to receive their peculiar type or character from the presence of worms, and were distinguished from other fevers by the name of *febres verminosæ*. The existence of worms in fevers, is now universally considered by all but the vulgar, amongst whom the exploded doctrines of antiquity so often and so obstinately linger, as a mere accidental complication, which may present itself in epidemics of the most different characters, and which exercises little influence either over their progress or their appropriate methods of cure.

During the greater part of the eighteenth century, however, the opposite opinion maintained its ground. Thus Baglivi says, let the diseases of children be what they may, we ought always to suspect worms; and some later writers, amongst whom Van den Bosch rendered himself conspicuous, attributed almost all diseases to the generation of worms in the intestines. Sauvages gives a list of upwards of twenty disorders which he supposed occasionally to have a similar source. Hoffmann endeavours, but very unsatisfactorily, to account for the frequent non-appearance of worms where he had expected to meet with them, in the following passage: "Plerumque tamen vermes non excernuntur si febris juncta, quia æstu febrili dissolvuntur in putridum magma." The morbid intestinal secretions were thus evidently mistaken by him for the remains of dead and corrupted worms, and it exemplifies a fact of which unfortunately instances are not wanting even in our own day, namely, that preconceived and theoretical notions may go a great way to counteract and pervert even the testimony of our senses.

The importance of worms continued long to be overrated even after Pringle and Sarcone had remarked that their presence in fevers scarcely required any peculiar modification in the treatment of these disorders; and after Bianchini in Italy, and De Haën in Germany had pointed out how exaggerated was the influence attributed to them by some other writers. Yet even De Haën himself did not rise altogether above the prejudices of his age on this matter, as he admitted the occasional existence of verminose epidemics, pleurisies, &c.

To British writers much of the credit of exposing and refuting this antiquated opinion is due. St. Clair, of Edinburgh, about one hundred years ago, proved that worms were not always discovered in the so-called worm fever, and pointed out the uncertain nature of most of the symptoms supposed to indicate their existence. Dr. Hunter declared that he had searched for them in vain in those who were said to have died of such disorders; and Musgrave proved that those affections were attributable less to the presence of these parasitic animals than to suburræ in the primæ viæ. Dr. Clark of Newcastle, in his work on fever, remarks on the impropriety of the term worm fever, and dwells upon the fact which he had ascertained by experience, that anthelmintics will rarely if ever cure it. In the year 1782, Dr. Butter's work on the Infantile Remittent Fever appeared, and it has continued ever since to be the chief authority on this subject. In this treatise he has approximated still more nearly to the truth than any of his predecessors, attributing the symptoms of the above named fever almost exclusively to a weak state of the digestive organs, to morbid accumulations in the primæ viæ, and to that peculiar irritability of habit and proneness to fever which distinguish the period of infancy. There is not, he asserts, the least ground for regarding worms in the treatment of the infantile remittent. He thinks, indeed, that they are deserving of little attention in the treatment of any of the diseases of children, except so far as is absolutely necessary for the satisfaction of friends; for though their existence may be a proof of disease, they are neither a cause nor a necessary symptom of such disease. He supports the singular opinion that they are nature's resource for consuming the superabundant morbid humours, and for stimulating the intestines by their movements, and thus assisting the peristaltic motion to carry off the remains of the offending load. This startling proposition, as to the positive utility of worms, which is sometimes attributed to Dr. Butter, and sometimes to Rush, does not appear to have originated with either of them, as we find the following passage in Rœderer and Wagler's valuable treatise "*De Morbo Mucoso*," of which the first edition appeared in 1762.—"Infantibus cæterum plethoricis pauciores hospites intestinales re verâ emolumento sunt, modestâ consumptione superfluum nutrimentum corpora noxium subtracturi."

Dr. Rush, from the frequency with which worms occur both in the young of the human species and of the lower animals without appearing to produce any disease, inclines to the opinion that they must serve some useful and necessary purpose in the animal economy, such as consuming the superfluous aliment which all young animals are disposed to take, and even suggests the probability of children sometimes being disordered for the want of them, asserting that it is in the grossest and most vigorous children that they are most frequently found. Worms are often discharged in small-pox and measles from children who never had any symptoms of them before, and are frequently discharged in swarms during fevers of all kinds. In the existence of such a disease as the idiopathic worm fever Rush has no belief, coinciding in opinion with the Indians of America, who ascribe the occasional discharge of worms to the fever, and not the fever to the worms. He admits, however, that they may sometimes give rise to anomalous symptoms in the course of a fever, and justify the blending of anthelmintics with the ordinary treatment. The symptoms said to indicate their existence are most deceptive, and none more so than that which is usually so much depended on, the picking of the nose. The actual discharging of worms from the bowels is, perhaps, the only symptom that is truly pathognomonic of their presence. Gardien, on the other hand, ridicules the idea of worms answering any beneficial purpose in the intestinal canal, and asserts that they occasionally give rise to a species of hectic fever. In support of this he states that he had himself met with one example of this, and refers to Morton and Trnka for others. He supposes them to be injurious, both by absorbing the chyle, and by the irritation they produce.

Sydenham is thought to have alluded cursorily to the infantile remittent, describing it as a kind of hectic, which holds children a long time, during which they languish with little heat, a loss of appetite, and a wasting of the whole body; and from this description Sauvages has established his species *hectica infantilis*, which is not, however, very well characterized, and might apply to the symptomatic fever accompanying mesenteric and other scrofulous diseases, as well, or perhaps better, than to the one in question, with which it has, notwithstanding, been considered as synonymous by most subsequent writers. An equal degree of doubt attaches to the *febris lenta infantum* of Hoffmann, usually given as another synonym of the disease. The probability indeed is, that several very dissimilar affections were crowded together under these titles, at a period when diagnosis was so much more imperfect than at present.

The infantile remittent, according to Dr. Butter, is distinguished by drowsy exacerbations, wakeful remissions, pain of the head and belly, total loss of appetite, little thirst, and slimy stools. He admits three varieties of the disease, viz. the acute, the slow, and the low infantile remittent.

The acute infantile remittent may begin suddenly, but is more commonly preceded for several days by symptoms of indisposition: the child looks unwell, and his colour is changed; he frequently picks his nose and lips, and has an offensive breath, short dry cough, anarexia, and flatulence, pain in the head and belly, with occasional enlargement of the latter. He starts, grates his teeth, and moans in his sleep; the urine appears milky soon after it is passed, and quickly deposits a whitish sediment. The belly is in extremes, either costive or loose. Fever soon supervenes, and is ushered in by a cold fit. The child is hot and restless at night, and diurnal exacerbations soon succeed. Of these there are often three in the twenty-four hours, one in the forenoon, one in the afternoon, and a third in the night, which is the longest and the most intense. When the fever is very severe, the remissions become very short and almost imperceptible. During the exacerbations all the symptoms become aggravated; the child is drowsy and sleeps, but not soundly, for he starts, moans, talks incoherently, and even screams in his sleep; there is a troublesome flatulence, more frequent cough, and accelerated respiration. Nausea and vomiting occasionally occur. The pulse varies from 140 to 160. In the remissions, all the symptoms abate; the child is wakeful and attentive to things around him, occasionally playful and disposed to leave his bed. If he chance to sleep, he now rests composedly, and the pulse is reduced to 120 or 130 in the minute. The skin is usually dry, both in the exacerbations and in the remissions; and if any sweats occur, they are partial, being limited to the head, breast, or palms of the hand. The abdomen and palms are always warmer than the rest of the body. There is complete loss of appetite and hardly any thirst, so that the patient in some cases can scarcely be got to take either food or drink, and often rejects them by vomiting as soon as swallowed. The urine is of a transparent orange colour, and the stools are always unnatural, either as to their colour, consistence, or smell; thus they are either paler or darker than in a state of health, more offensive, consisting often almost entirely of slime, and occasionally frothing and fermenting like barm. Worms are in some cases thrown off by vomiting or stool, and sometimes crawl spontaneously out of the body either by the mouth or anus. As the fever declines, the exacerbations become milder and shorter, the appetite returns, long and refreshing sleep and a general moisture of the skin takes place, the pulse falls, and the urine deposits a copious sediment, leaving the supernatant fluid of a straw colour; this sediment gradually diminishes, and the stools assume a healthy appearance. The pulse, however, occasionally continues quick long after all the other symptoms have disappeared, and till the patient has nearly regained his flesh and strength. The ordinary duration of the complaint is from one to three weeks or longer.

The slow variety of infantile remittent comes on with the same symptoms, but more gradually and imperceptibly than the acute, the flesh and strength slowly declining, the appetite being unequal, the belly often enlarged, and the breath offensive. There is but one well-marked exacerbation, which, taking place in the evening, lasts till morning, and is succeeded by a profuse sweat. Throughout the day the skin is dry and harsh, and hectic flushings are frequent. The pulse seldom exceeds 140 in the exacerbations, and is about 100 in the remissions. The patient is weak, indolent, listless, and disinclined to move, as any attempts at walking makes the limbs ache. Yet he is rarely so ill as to be confined to bed. The day as well as the night is passed mostly in dozing, and in his sleep he often starts and moans, and picks his nose and fingers till they become sore and scabby. The tongue is white and moist; there is no appetite, and little thirst; the urine is of a deep orange colour; that passed in the morning deposits a sediment—that during the day contains only a cloud. The stools are of the same unnatural character as in the acuter form. When the fever is about to decline, the nocturnal exacerbations and succeeding sweats abate; the flushings become less frequent, whilst all the other morbid symptoms gradually disappear, and the patient recovers his flesh, strength, colour and cheerfulness. This variety may last for two or three months or more.

The low infantile remittent fever begins suddenly, and for the first week perfectly resembles the acute, save that the head is more affected, and delirium sometimes occurs. After this the low state succeeds, the child becoming quiet, indifferent to surrounding objects, and indisposed to answer questions. He rarely asks for any thing, but takes his food or drink when it is offered to him; the trunk and lower extremities generally remain fixed in one posture, but the arms and hands are almost always in motion when he is awake: sometimes he flings them about, and at other times picks not only his nose and lips, but even his tongue, eyes, and other parts of his face till they become sore. At the height of the disease the difficulty of replying to questions, arising from debility, terminates in a temporary loss of speech and voice, and the jaws are occasionally locked together. He slumbers much during the exacerbations, and in the remissions performs with his hand the gesticulations above described. When the low stage sets in, the eyes are reddish, dull, and inattentive; the countenance is expressive of distress, and the tongue, teeth, and lips, are covered with a blackish fur.—The patient is particularly uneasy before stools, or the escape of flatulence. The urine and stools, which are of unnatural appearance, are involuntary, yet he is quite sensible. The pulse, which is about 100 in the remissions, rises to 120 in the exacerbations. When the disease takes a favourable turn, the exacerbations become shorter, the child is less drowsy, the eyes are clearer and more observant, the countenance is placid, and the tongue cleaner, the pulse is calmer, and the appetite returns. The voice is regained, and, though weak at first, soon becomes stronger, and is frequently exercised, as he cries whenever he is disturbed or wants any thing, or if he feels himself unable to reply to questions, or to put out his tongue when desired. The strength, flesh, and colour are gradually recovered, and he yawns, sneezes or coughs, which he was previously unable to do. The urine, which is of a straw colour, is still for a considerable time passed involuntarily. The crying and fretfulness long continue. The stools at length become natural, and there is no complaint made but of weakness. The pulse occasionally continues accelerated till the recovery is complete.

The duration of this fever is from a month to six weeks, or even longer.

Perhaps the preceding account might be simplified with advantage in a practical point of view, and a nearer approach to the truth made, by considering the infantile remittent in the first place as a disease of indeterminate duration; by this the first and second subdivisions would be got rid of; and in the second place, as liable to be considerably modified by the habit and health of the individual, and the epidemic constitution of the season, which would enable us to discard the third variety.

According to Dr. Pemberton, who has given a simpler description of this disorder, the fever is merely symptomatic of derangement in the intestines. The affection comes on very gradually, and first manifests itself by irregularity in the bowels, which more frequently are costive, though sometimes they are too much relaxed. In the course of the day there are several slight accessions of fever, which are marked by drowsiness, the child in the intervals appearing perfectly well, though always peevish. The appetite is variable, and the pulse ranges from 100 to 130. This state of things lasts for eight or ten days, when all at once a more violent paroxysm preceded by rigor and vomiting takes place, the pulse rises in frequency, the drowsiness is increased, and the cheeks are flushed but there is not the least pain complained of in any part, except now and then slight pains shooting through the abdomen. Incessant picking of the skin of the nose, lips, and angles of the eyes, is a symptom which is almost invariably present. The function of digestion seems to be almost totally at a stand, for if any food be taken it is brought up a considerable time after unaltered. "The intestines also seem to be in a manner paralysed; they exert no action on the food, for it passes off like a mass of putrid animal and vegetable matter which had been sometime subjected to heat and moisture, without its having the smallest resemblance either in appearance or smell to those fæces where the powers of digestion have been exerted." The appetite is quite lost, and delirium occasionally occurs for two or three days together, but does not indicate that the case will be peculiarly severe or contracted.

There is a symptom which we have met with in this disease, which has been omitted in most of the descriptions of it, viz., a stiffness in the neck, and an intolerance of pressure in the upper part of the spine; with this a general increase of the sensibility of the whole surface of the body seems sometimes to coexist, so that the child can scarcely bear to be touched in any part. The first of these symptoms has not, however, escaped the notice of Heberden. "In the fevers of children," says this accurate observer, "the face is sometimes drawn to one shoulder. I have often seen this, but never knew it continue long after the fever was cured." He alludes to it in another part of his work under the name of "the wry neck of children." Underwood has also noticed it. A similar stiffness about the nape of the neck occasionally occurs in cases of dyspepsia in adults.

The infantile remittent fever, according to Dr. Butler, may be either sporadic or epidemic, and in the latter case it appeared to him to be occasionally contagious. Dr. Sims gives the following description of an epidemic infantile remittent, which occurred simultaneously with the prevalence of a low nervous fever amongst adults. "It was called," says he, "by some a worm fever, though I believe worms were seldom the cause; yet, as that lay apparently in the stomach and intestines, the error did not materially affect the practice." The leading symptoms were heat, thirst, quick pulse, vomiting, coma, and sometimes slight convulsions, an universal soreness to the touch, troublesome cough, and extreme peevishness. The fever was constantly of the remittent kind, the cheeks often appearing highly-flushed, at other times very pale; it lasted for several days, but seldom beyond a week, and the fatality, though greater than in the fever existing at the same time among adults, was not very considerable. Many of those who were seized by it had been subject for a length of time to those symptoms which are thought to point out the existence of worms in the primæ viæ; such as picking the nose, grinding the teeth, and starting out of the sleep, swelling of the belly, white urine, short dry cough, &c.; yet worms scarcely ever appeared.

From what we have seen of this affection, as well as from a careful consideration of the best descriptions which have been given of it, we are disposed to consider it merely as a variety of gastric fever, modified by the irritable constitution of infancy, and closely allied to, if not identical with, the *febris pituitosa* of Frank. Feverish affections in all feeble and nervous subjects, as well as in infants, manifest a tendency to nightly exacerbations. Richter conceived that every fever which presents remissions partakes more or less of the gastric character; and Selle recognised no other kind of remittent fevers except the gastric and the hectic.

In France this affection is, like most other fevers, considered to be and treated as a species of gastro-enteritis. That a depraved state of the secretion of the mucous membrane exists is evident, but that this necessarily depends in all cases on inflammation has not been satisfactorily made out; and we believe that medicines which slightly increase and modify the secretions of this surface will generally be found to conduct the disease to a favourable termination more speedily than the sole employment of directly antiphlogistic measures.

The irritation which exists about the nostrils and angles of the mouth, and the scabby eruptions which frequently appear in the latter of these situations, together with the state of the tongue, the total loss of appetite, the faint sickly smell of the breath, the morbid condition of the alvine secretions and of the urine, the swelling of the belly, the good effects of purgatives, and the fact that the gradual subsidence of the fever keeps pace with the improvement in the stools,—all taken conjointly, seem to point in a manner which cannot be mistaken to the chylopoietic viscera as the original seat of the disease.

The premonitory symptoms, especially the obstinacy and irregularity of the bowels, fetid breath and gradual failure of the appetite, together with the causes of the disease, which seem to consist chiefly in the use of improper food and neglect of the bowels, (circumstances which, like the fever itself, are of much more frequent occurrence amongst the children of the poor than of the rich,) all tend to confirm the above view of the nature of this affection.

The prognosis under proper treatment and exact compliance with directions on the part of the attendants, is mostly favourable. A return of appetite, an improvement in the character of the evacuations, and the remissions becoming lengthened, are signs of approaching health. If, on the other hand, the exacerbations increase in frequency, and the fever becomes almost incessant, and the abdomen swollen, the case is not without danger. In a fatal case of this kind, recorded by Pemberton, the intestines on dissection were found enormously distended, and the mesenteric glands slightly enlarged. No inflammation, however, was detected either in the bowels, peritoneum, or any of the viscera, nor was there any effusion into the abdominal cavity. This inflation of the intestines and occasional enlargement of the mesenteric glands is also mentioned by Hoffman. The infantile remittent sometimes passes into hydrocephalus, especially when it is neglected or mismanaged. The possibility of such a termination should never be forgotten, else the moment for active treatment will be lost irretrievably. Dr. Cheyne believes that such a transition would be much less frequent if it were more the practice to bleed children in those febrile attacks which commence with sickness, vomiting, and fullness of the hypochondria. Besides, cathartic medicines would then be found to act more readily, and the crisis would occur on an earlier day.

The diagnosis of infantile remittent from hydrocephalus often presents great difficulty. Sims believed that the distinction in children under five or six years of age was often impracticable until within a day or two of the fatal period, when the dilatation of the pupils, and insensibility of the eyes to light, point out the latter disease too strongly to be mistaken. Pemberton, however, thinks that hydrocephalus may almost always be recognised by the screaming in the sleep, tossing of the hands over the head, and the continual effort to thrust the head backwards; by the intolerance of light, strabismus, interruption of the intellectual faculties, and by food being taken without discrimination or reluctance. In infantile remittent, on the contrary, there is seldom screaming or intolerance of light, there is no strabismus, the intellectual faculties can be roused, the appetite is so totally destroyed that the child can scarcely be persuaded to take either food or medicine. The discharges from the bowels are very unnatural, often black, and smelling like putrid meat, sometimes curdled, with shreds of coagulable lymph floating in a dark greenish fluid. In very young children the irritation may cause convulsions, and during the fit it is totally impossible to determine whether the head or the intestines be their source. If, however, after the fit is over the faculties be completely restored, this, taken conjointly with the preceding symptoms of the case, will enable us to ascribe them pretty confidently to disorder of the intestines. Moreover, the convulsions in the latter case occur early in the disease, and occasionally usher in the fever.

According to Gölis, who has been at much pains to discriminate these affections, the infantile remittent, or mucous worm fever as he calls it, may be distinguished from hydrocephalus by having no distinct stages, the pulse being accelerated throughout, and never falling below the natural standard, and by the length of time to which the disease usually runs on, viz., from three to six weeks; by attacking phlegmatic, over-fed, and large-bellied children; by its usually well-marked remissions; by the face being pale and swollen, the expression stupid, and the manner sluggish; by the dulness and indistinctness of the pains in the abdomen and head, which are indeed scarcely at all complained of; whilst in hydrocephalus the pain in the forehead is very acute, and alternates with that in the stomach or bowels, and is accompanied with a feeling of tension in the nape of the neck, and occasionally with pains in the limbs. In the worm fever the child sleeps soundly and is awakened with difficulty; it perspires freely after each exacerbation; it maintains its posture in bed, and does not toss about as in hydrocephalus: a strong light does not pain the eyes, nor is there blindness at any stage: the hearing is slow, particularly towards the end of the fever, whilst in hydrocephalus it is peculiarly sharp; the nostrils are moist, and the smell acute, and an intolerable itching is felt in the nose, all of which is otherwise in the affection of the head. In the infantile remittent, vomiting is a rare and accidental occurrence, and the respiration is accelerated throughout the whole course of the disease; the bowels are comparatively easily acted on by medicine, and there is little wasting of the body or shrinking of the belly, but on the contrary much flatulent distension. If convulsions occur, they are not followed by permanent paralysis. The miliary eruption, so frequently associated with gastric diseases, may appear, but it is quite unlike the peculiar exanthematous affection described by some of the German writers as occasionally occurring in the last stage of hydrocephalus.

The means recommended by Dr. Butter for allaying the febrile irritation, consist in keeping the patient quiet in bed in a chamber of moderate temperature, and from which the light is in a great measure excluded. All solid food and stimulating drinks are to be withheld, and diluting and slightly nourishing fluids freely supplied, as weak broths, gruel, and barley-water. The bowels should be kept gently open, so that one stool may be procured daily in the low fever, two in the slow, and three or four in the acute variety. For this purpose he was in the habit of giving the preference to the neutral salts, and especially to the sal polychrest, on account of its promoting urine as well as stools, and allaying, as he thought, the febrile irritation by its operation on the nervous system even before it had produced any sensible evacuations. For a child of five years old he usually ordered one drachm of the above salt dissolved in four ounces of water, and sweetened with two drachms of sugar. Of this mixture two spoonsful were to be taken from time to time, so as to finish it in twenty-four hours. When the body was sufficiently open, he sometimes substituted the nitrate of potass; or when diarrhœa existed, five grains of the extract of conium dissolved in the same quantity of water as the preceding mixture, and to be taken in the same manner. The quantity of extract of conium given daily was in the proportion of one grain for every year of the child's age, and a sufficient quantity of sugar was added to render it palatable. He thought the hemlock had much influence both in relieving the fever and carrying off the looseness. In the slow fever, where the neutral salts failed, he sometimes employed the extract of conium with good effect, at the same time keeping the bowels open with sal polychrest, or with a moderate dose of rhubarb nightly. In this variety he also recommends three or four drops of elixir of vitriol every fourth hour, and the use of weak wine-whey by turns with broth and gruel. In some cases bark appeared useful, though he rarely found it necessary to have recourse to it. If the child be very noisy and restless, the abdomen should be repeatedly fomented, by which the patient will often be speedily tranquillized and sleep induced. This measure is especially necessary when the abdomen is tense and *swollen*.

Such is the plan of treatment recommended by Dr. Butter; but in an affection where there is such strong evidence of deranged and deficient action, not only of the bowels themselves, but also of the stomach, liver, and other viscera concerned in digestion, stronger medicines, which may have a greater power of restoring or modifying the function of secretion in these organs, seem called for. Under this impression we usually commence with a few doses of calomel, rhubarb, and jalap, in addition to which, if the bowels be very obstinate, a mixture of infusion of senna with salts may be necessary. The occasional interposition of calomel and antimonial powder at night has sometimes seemed to have considerable influence both in improving the stools and in controlling the febrile symptoms. A similar practice is strongly recommended by Dr. Cheyne in his work on hydrocephalus. "Antimonials," says this able practitioner, "in combination with cathartics, and more especially calomel, have appeared to me very useful in those cases of infantile remittent fever in which the sensorial functions are much oppressed, as also in the commencement of febrile attacks of a less definite nature, which are liable to degenerate into hydrocephalus. In such cases I prescribe a pill of calomel and antimonial powder three times a day, interposing between every two pills a moderate dose of the common purgative mixture.

Though advocates for the purgative system in this disorder, we are convinced that it may be, and often is, pushed quite too far. To clear out the bowels, and gradually to modify the alvine secretion, should be our sole object. The danger of inordinate evacuations in this disease was well known to Sydenham, who confined his treatment to an infusion of rhubarb in beer, made so weak as to act rather as a mild aperient and stomachic than as a purgative. By over-purging, the tone of the intestines may be totally destroyed and tympanitis induced. If the case runs on for several weeks, enemata and alternate doses of rhubarb and hydrargyrum cum cretâ, or the latter alone, if the bowels be sufficiently free, may be had recourse to. In very obstinate cases, repeated doses of calomel combined with opium and antimony have been found useful by Dr. Hamilton. With a view of restoring the tone of the intestines and stomach, Dr. Pemberton was in the habit of giving thrice a day a light and aromatic infusion of cascarilla throughout the whole disorder. In an advanced period of the disease fractional doses of the sulphate of quinine may tend to accelerate convalescence. Dr. Clarke, to whose work we have already alluded, is, however, an advocate for an earlier employment of bark, to which, after the exhibition of an emetic, and one or two doses of an active purgative, he had immediate recourse. "By this means," says he, "the nervous symptoms which so frequently accompany fevers in the delicate habits of children, are for the most part happily obviated." Any little experience we have had in this mode of practice has by no means tended to confirm its propriety.

Manningham, in his treatise on the Febricula in adults, an affection which has many points of analogy with the remittent fever of infancy, appears to have been very averse to the use of bark, as well as of bloodletting and strong purgatives, confining himself to a mild emetic at the commencement, and to occasional doses of rhubarb, and gentle diaphoretics throughout, along with effervescing draughts during the exacerbations. Stoll, in speaking of the febris pituitosa, which frequently runs on for several weeks, asserts that a very cautious and temporising method of treatment is the safest and most successful. We cite these authorities rather to show the necessity of great circumspection in the treatment of this disease, than to justify a timid or inert line of practice.

When recovery has at length taken place, a return to the usual diet and way of life should be very gradual, and attention to the regulation of the bowels long persisted in. Preparations of iron, together with country air, regular exercise, and light nutritious food are the most effectual means of re-establishing the constitution in its original vigour.

W. B. Joy.

FEVER, HECTIC. Our word hectic, derived from the Greek ἑκτικὸς, habitual, is often used substantively, like the Greek feminine, to denote an habitual or very protracted fever; but more generally it is employed in conjunction with the word fever to designate the same disease.

This fever is attended by the following symptoms. The general appearance of the surface is pale, excepting the cheeks, on which there is often a delicate and circumscribed bloom. There is emaciation, which is progressive, and sometimes very rapidly so, although the appetite is good and the digestive functions appear to be well performed. The pulse is generally hard, and in point of frequency always above the healthy standard of the individual affected, but particularly so at two periods of the day, noon and evening, when there is an exacerbation of all the febrile symptoms most conspicuous at the latter of these periods, and these exacerbations are preceded by a chill, generally slight, though sometimes considerable. The respirations are rapid and short, readily accelerated by any exertion, and attended frequently with a cough, even where an affection of the thoracic organs is not the source of the disease. The skin is warm, especially in the palms of the hands and on the face, and at the commencement of the fever generally dry; but before it has lasted long, there is a disposition to perspire on any exertion, and a gentle perspiration may generally be observed after the noon-day exacerbations, and one very profuse towards morning, which may be considered as the resolution of that of the evening. The urine is various, being sometimes pale and without deposit, and at others high-coloured, and letting fall a lateritious sediment. The bowels at the commencement of the disease are often costive, and occasionally remain so to the close; but more commonly a colliquative diarrhœa occurs in the advanced stage. The tongue is generally clean; as the disease advances it frequently becomes dry and glazed, and ultimately its surface is covered with aphthæ; there is considerable thirst; a sense of dryness in the throat and fauces; and in the latter stage of the disorder these parts manifest the same aphthous appearance as the tongue. The eyes are generally bright and expressive, with the conjunctivæ of a pearly whiteness; the nails become incurvated; the adipose and muscular substance are rapidly absorbed, so that the eyes are sunk in the orbits, the temples excavated, and the whole frame is much attenuated, excepting the inferior extremities, which are often œdematous; the sleep is disturbed and unrefreshing; and there is a continual feeling of lassitude and debility; but, with all this failing of the physical powers, the mind remains cheerful and unclouded, and seems to gather hope from the causes of despair.

With respect to mere external character, hectic bears a greater affinity to periodic than to continued fevers, and of the former resembles most the remittent; though cases are occasionally observed in which the severity of the rigor preceding the exacerbation, and the almost complete apyrexia consequent on the sweating stage, assimilate it considerably to intermittent. As to its intrinsic nature, it may be considered as the general irritation produced by the sympathy of the constitution with a local disease, "of which it is conscious, and which it cannot relieve itself of and cannot cure." (Hunter on the Blood, vol. ii. p. 377. London, 1812.) A severe and enduring local affection is required to produce hectic; but at the same time it is to be remarked that peculiarity of individual constitution is an important element in its production. An amount of local suffering with which a robust constitution might fail to sympathize, or with which it might not sympathize in the form of hectic, may, in a person of more delicacy and mobility, produce what Mr. Hunter has very happily termed this "slow mode of dissolution." The amount of local affection requisite to produce this disease varies, too, according to the nature and functions of the parts in which such affection is seated. The system will much more readily sympathize with an abscess or other disease of a vital organ, such as the lungs, heart, liver, stomach, intestines, mesenteric glands, or kidneys, than with a similar disorder existing in the muscular or cellular tissue near the surface of the body. Diseases of parts of which the powers of reparation are feeble, and which consequently, when diseased, keep up a protracted irritation in the system, often give rise to hectic. Hence we frequently observe it as a consequence of diseases of bone, ligaments, and tendons, and of abscesses connected with diseases of these tissues, such as psoas abscesses and those produced by diseased joints. If the nature of the local affection is such as the powers of the constitution have little or no control over; if, for instance, it is scrofulous, cancerous, rachitic, and particularly if it is tubercular, hectic very generally arises; and likewise, on the same principle, it is not unfrequently produced by a long-continued mechanical irritation, as that of a calculus in the kidneys or bladder, or of a foreign body in the trachea, (of which a case is related by Borelli,) and on the removal of the irritating cause it occasionally ceases.

Mr. Hunter was of opinion that hectic might be an original disease of the constitution independent of any local cause; and Dr. Willan, Dr. Perceval of Dublin, (Note on Good's Study of Medicine, first edit. vol. ii. p. 167,) Trnka, and some others have expressed the same sentiment; but it is by no means a general one. Mr. Hunter guards his opinion by a qualification, for he states that the constitution may fall into this mode of action without any local cause "*that we know of;*" and on examining the evidence on the subject, we are led to conclude that this qualification explains the existence of a sentiment in this author and others so little in accordance with that of the profession generally, and that the imperfection of diagnosis alone has led to the supposition that this may be an idiopathic disease. We are told, for instance, that hectic may exist without pulmonary affection for three months, and then break out in the lungs. (*Mason Good,* loc. cit.) From the extreme difficulty of detecting the presence of tubercles in their unsoftened state, even with the improved methods of diagnosis now employed, is it not reasonable to conclude that these bodies had existed in the lungs undetected, and produced the fever; since we find this affection, which of all is most frequently attended with hectic, ultimately displaying itself by manifest signs? The writer saw some years ago a case of apparently idiopathic hectic which proved fatal; an examination of the body showed the existence of small abscesses in the muscular substance of the heart; and we believe that in other instances, what is supposed to be primary hectic is equally the sign of an undiscovered local irritation or lesion. A fever in all respects resembling hectic supervenes on profuse hemorrhages; but this will not be found on consideration to form an exception to the general rule. The system is left by hemorrhage in a state favourable to the production of this form of disease on the application of any irritating cause, and the nutriment given to recruit the strength of the patient, acting on the enfeebled alimentary canal, becomes such a cause, for hectic will ever be found most apt to occur in such cases where a stimulating regimen is employed.

Treatment. — On this branch of the subject we have little that is satisfactory to communicate. If the local cause is of a nature to admit of correction, or if irremediable, so situated that it can be removed, the accomplishment of one or the other should be attempted; but in the majority of instances neither is practicable. The constitutional treatment is principally restricted to regulating the bowels by gentle laxatives when the patient is costive, or by opiates and astringents when diarrhœa exists. The diet should be light and nutritious; and a pure and moderately warm air should be selected for the patient when circumstances render it attainable. Tepid, or even cold ablution, or sponging during the height of the febrile exacerbation, is refreshing, and tends to diminish the colliquative perspirations. Tonics have been recommended, and sulphuric acid is as eligible as any medicine of this class; but they do not merit much confidence. Besides the use of opiates to check diarrhœa, they may be employed to allay irritation and procure sleep.

Joseph Brown.

FEVER, PUERPERAL. This term was first employed by Dr. Strother, in the year 1716, to designate the most fatal inflammatory disease to which child-bed women are liable. The name is now generally employed by medical writers, and it is considered to be synonymous with the terms *puerperal* peritonitis, child-bed fever, peritoneal fever, or the epidemic disease of lying-in women.

The records of medicine afford indubitable evidence of the fact, that puerperal or child-bed women have, from the most remote periods of antiquity, been liable to attacks of this destructive affection. In the works, however, of the earlier authors, its history is short and imperfect; and it is probable that the disease did not attract the particular attention of physicians before the middle of the seventeenth century, when it occurred at Paris as a malignant epidemic in the lying-in wards of the Hôtel Dieu. Since that period it has often been observed in the principal cities and lying-in hospitals of Europe, both in a sporadic and epidemic form.

The most vague and contradictory opinions have hitherto prevailed respecting the nature and treatment of this disease. Inflammation of the peritoneum, omentum, or some of the abdominal viscera, has been considered as the cause of all the phenomena; and for the treatment, copious bloodletting and cathartics have been recommended. Other writers, who refer all the local and constitutional symptoms to a specific fever, peculiar to women in the puerperal state, deprecate the employment of venesection, and urge the necessity of employing the most powerful stimulants and cordials. The morbid sensibility of the hypogastrium, usually observed at the commencement of the attack, and the changes of structure from inflammation often discovered after death, both in the uterine and other organs, they have considered as the consequences of this idiopathic fever, in like manner as inflammation of the brain, lungs, or intestines, often supervenes in the progress of typhus.

Those who have most attentively perused the works of Hulme, Leake, Denman, Walsh, Gordon, Joseph and John Clarke, Hamilton, Hey, Armstrong, Douglas, Mackintosh, and Campbell, must have been convinced that the pathology of puerperal fever required a more complete investigation than had been made by any one of these distinguished authors. To reconcile their discordant statements with respect to the nature and treatment of the affection, it appeared requisite that it should be examined not only in hospitals, but also in private practice, for several successive years, throughout all the different seasons. In this manner only did it seem possible to ascertain whether they had described diseases essentially distinct, or merely varieties of the same affection, modified by some powerful but unknown causes.

From the 1st of January, 1827, to the 1st of June, 1832, one hundred and sixty-two cases of well-marked puerperal fever came under our immediate observation in private practice, and in the British Lying-in Hospital, and other institutions in the western districts of London. We watched the symptoms and progress of these cases with the closest attention, observed the effects of the different remedies employed, and, where death took place, we carefully examined the alterations of structure in the uterine and other organs.

Of fifty-six cases which proved fatal, the bodies of forty-four were examined, and in all there was found some morbid change, the effect of inflammation, either in the peritoneal coat of the uterus, or uterine appendages, in the muscular tissue, in the veins, or in the absorbents of the uterus, which accounted in a most satisfactory manner for all the constitutional disturbance which had been observed during life. The peritoneum and uterine appendages were found inflamed in thirty-two cases; in twenty-four cases there was uterine phlebitis; in ten there was inflammation and softening of the muscular tissue of the uterus, and in four the absorbents were filled with pus. These observations are subversive of the general opinion now prevalent in Europe and America, that there is a specific, essential, or idiopathic fever, which attacks puerperal women, and which may arise independent of any local affection in the uterine organs, and even prove fatal without leaving any perceptible change in the organization of any of their different textures. As the constitutional symptoms thus appear invariably to derive their origin from a local cause, it would be more philosophical, and more consistent with the correct principles of nosological arrangement, to banish entirely from medical nomenclature the terms puerperal and child-bed fever, and to substitute in their place that of *uterine inflammation*, or *inflammation of the uterus and its appendages in puerperal women*. The terms puerperal peritonitis and peritoneal fever, employed by some English and foreign physicians, are not less objectionable than puerperal fever, for in many of the fatal cases there is no proof whatever of the existence of any affection of the peritoneum.

All writers agree that in puerperal fever there is exquisite sensibility of the abdomen with pyrexia, and that these are the only invariable and characteristic symptoms of the disease. After the inflammatory symptoms of the uterine organs subside, those of collapse follow, as in the last stages of inflammation of the brain, lungs, liver, intestines, and other abdominal viscera: then the belly becomes distended and tympanitic; and after death extensive alterations of structure remain in the uterus and its appendages; while the other important external and internal organs present no morbid appearance. Besides, there is nothing which can be discovered in the condition of a puerperal woman to render her more liable to attacks of typhus fever than any other individuals; and lying-in women, as we had an opportunity of observing in the epidemic typhus of Edinburgh in the years 1816 and 1817, and during the last five years in this metropolis, are rarely affected with common typhus. It is to the uterus, which is left in a condition after delivery to which no other organ of the body is ever similarly placed, and which renders it peculiarly liable to attacks of inflammation, that we are to look for an explanation of all the phenomena of puerperal fever.

Until a recent period, the pathological anatomy of the uterine organs in puerperal women had not received that due attention which its importance demanded. In the histories of the different epidemic fevers which have prevailed amongst lying-in women since the middle of the seventeenth century, the symptoms and the morbid appearances, though imperfectly described, nevertheless strongly confirm the accuracy of the conclusion, that the whole phenomena, local and general, of these fevers, are to be referred to inflammation of the uterine organs; and that the symptoms vary according as the superficial or the deeper-seated structures of the uterus are affected.

It is stated by Peu, that in 1664 a prodigious number of puerperal women perished in the Hôtel Dieu, and that the cause of this mortality was attributed by M. Vesou, physician to the hospital, to the circumstance of the lying-in wards being situated immediately over those set apart for the reception of individuals who had been wounded. The women were attacked with hemorrhages, and on opening their bodies they were found to be full of abscesses. (*Peu*, Pratique des Accouchemens, p. 268.)

This brief and imperfect account of the disease when first observed as an epidemic, is interesting from this circumstance, that no further notice is taken of it by the French writers during the succeeding hundred and twenty-two years, for the whole of which period the lying-in wards of the Hôtel Dieu remained contiguous to the wards of the sick and wounded. It is not distinctly stated by Vesou whether it was in the uterus, or in the viscera of the thorax, head, or abdomen, that abscesses were observed on dissection; but it will hereafter appear that the presence of abscesses in any part of the body of a woman who has recently been delivered is one of the strongest proofs which can be obtained of the previous existence of inflammation in the deeper-seated textures of the uterine organs.

The winter of 1746 at Paris was most destructive to puerperal women, and they died between the fifth and the seventeenth day after their confinement. The epidemic attacked the indigent, but much less frequently those delivered at their own habitations than in the Hôtel Dieu. Of twenty women in child-bed affected with the disease in February of that year in the Hôtel Dieu, scarcely one recovered. (Mémoires de l'Academie des Sciences pour l'année 1746.)

M. Malouin has given the following history of the symptoms and progress of this epidemic. "The disease usually commenced with a diarrhœa, the uterus became dry, hard, and painful; it was swollen, and the lochia had not their ordinary course: then the women experienced pain in the bowels, particularly in the situation of the broad ligaments; the abdomen was tense; and to all these symptoms were sometimes joined pain of the head, and sometimes cough. On the third and fourth day after delivery, the mammæ became flaccid. On opening the bodies, curdled milk was found on the surface of the intestines, a milky serous fluid in the hypogastrium, a similar fluid was found in the thorax of certain women, and when the lungs were divided they discharged a milky or putrid lymph. The stomach, the intestines, the uterus, when carefully examined, appeared to have been inflamed. According to the report of the physicians, there escaped clots on opening the vessels of this organ."

"This terrible disease," says M. Tenon, "has shown itself at different epochs, and its returns have been more frequent than ever; it re-appeared every winter from 1774; it commenced usually about the middle of November, and continued till the end of January. It is met with also at the other seasons of the year, even during spring, for it has come to prevail more and more, and to be as it were naturalized. (Mémoires sur les Hôpitaux de Paris, p. 243.)

"Those who were attacked in the years 1774 and 1775 died between the fourth and seventh days after the delivery, and seven out of every twelve women who were delivered were seized with the disease. Two distinct forms of it were successively observed, one a simple form, which was cured by ipecacuan; the other a complicated form, for which there was no remedy; so that there perished in 1816, one of every seven of those who were attacked with puerperal fever, and death took place from the sixth to the eighth day after delivery, and often much earlier.

"The first symptoms manifest themselves twenty-four, thirty-six, or forty-eight hours after delivery, and sometimes, but rarely, in the space of twelve hours. The symptoms of the simple puerperal fever are developed in the following order; rigor, slight pain in the region of the kidneys, intestinal colic, which in two hours affects the whole hypogastrium, and gradually becomes more acute. Pulse concentrated, fever moderate, lochia not suppressed; mammæ flaccid, tongue dry in the middle, covered with a yellow mucus on the edges; hiccup, and vomiting of green-coloured matters. There was sometimes combined with these constant and characteristic symptoms of the disease which took place in the years 1774 and 1775, a diarrhœa of a bilious glairy matter, a considerable swelling of the hypogastrium, thirst, and remarkable retention of urine.

"In the complicated puerperal fever, the pyrexia is stronger, with exacerbations; the tongue is black and dry, the belly is tense, distended and tympanitic, and slightly painful. In some women the lochia have been either wholly suppressed or only diminished, others have experienced attacks of ophthalmia; in some the respiration was difficult; in general the blood showed the buffy coat.

"On opening the abdomen, the stomach, the intestines, particularly the small intestines, were inflamed, adhering to one another, distended, filled with air and a yellow fluid matter. The uterus was contracted to its ordinary dimensions, and was seldom found inflamed. I had occasion to dissect two; in one the uterus contained a coagulum of blood; an infiltration of a milky appearance or whey-like fluid existed in certain women in the cellular membrane which surrounds the kidneys. Sometimes, also, a thick, white, cheesy matter was met with. When the lungs were gorged with blood, or inflamed or emphysematous, an effusion of serum was found in each side of the chest. We did not observe the hemorrhages which occurred in the epidemic of 1664, and the uterus was not found dry, hard, and tumefied, as in that of 1746. In the epidemic of 1774, the lochia flowed, but they did not flow in 1746."

From 1782 to the present time, the same fatal disorder has appeared at different times in the Maternitè at Paris, and in many of the continental lying-in hospitals, and the same morbid appearances have been observed on dissection.

The bodies of fifty-six women were examined who had died of puerperal fever in the general hospital at Vienna, in the autumn of 1819, and in all of these, with the exception of two, where delivery had taken place a considerable time previous to death, effusions of sero-purulent fluid were found in the abdominal cavity, and traces of inflammation in one or more of the abdominal viscera. The ovaria and fallopian tubes were always more or less swollen, red, and tender, and the body of the uterus was, in consequence of inflammation, flabby, tender, and easily broken down with the finger. It is also stated in the report of this epidemic, that the accession of fever is always preceded by marked changes in the whole system, particularly in the uterus, clearly indicating an inflammatory state. The symptoms indeed were such, that the inflammation combined with high fever could not be mistaken. (Medical Annals of the Austrian States, 1822.)

Pinel, Bichat, Laroche, and Gardien found the peritoneum inflamed in so many fatal cases of puerperal fever, that they have considered this disease essentially to depend on inflammation of the peritoneum. A French author, who has subsequently observed the disease, and who entertains the same views of its nature, asserts that nothing can be more absurd, more chimerical, or more contrary to the spirit of analysis and observation, than the idea that there is a fever essential or peculiar to women recently delivered.

If we consult the works of the most celebrated writers in this country on puerperal fever, it will clearly appear that they all describe the disease as commencing with a sense of soreness or exquisite tenderness in the region of the uterus; and that where it proves fatal, the appearances on dissection are such as to afford unequivocal proofs of inflammation of one or more of the pelvic and abdominal viscera.

Strother, Burton, Millar, and Wallace Johnson, state that the distinguishing marks of the disease are pain of the hypogastric region, abdomen, and loins, and that relief often follows venesection.

Drs. Hulme and Leake considered inflammation of the omentum to be the proximate cause of puerperal fever, and the latter suspected that the whole mass of circulating blood becomes contaminated by absorption of the fluids effused into the peritoneal sac. "Considering," observes Dr. Leake, "the suppuration of the omentum, and large quantity of purulent fluid in the abdomen after death, it is easy to see how a secondary fever, which was truly inflammatory at the beginning, may soon become putrid by absorption of that fluid, which, like old leaven, will taint the blood by exciting a putrid ferment in the whole mass, and change its whole qualities into that of its own morbid nature. Some of those who survived recovered very slowly, and were affected with wandering pains and paralytic numbness of the limbs, like that of chronic rheumatism. Some had critical abscesses in the muscular parts of the body, which were a long time in coming to suppuration, and, when broke, discharged a sanious ichor." (Leake on Child-bed Fever, &c. vol. ii. pages 90–92.)

Dr. William Hunter observes, that on examining the bodies of these who have died from puerperal fever, the viscera and every other part of the abdomen are found to be inflamed. There is a quantity of purulent matter in the cavity of the abdomen, and the intestines are all glued together.

Pain of the head and abdomen with fever were the symptoms which Dr. Lowder considered to be pathognomonic of the disease; and redness of the peritoneum, adhesion of the intestines, effusion of serum mingled with pus and lymph, the most frequent morbid appearances.

The history of the symptoms and morbid changes of structure, by Dr. Joseph Clarke, Gordon, Campbell, Mackintosh, and other writers, is nearly the same; and Professor Hamilton, who believes that puerperal fever is a fever sui generis, nevertheless admits that the appearances on dissection are exactly similar to the descriptions generally given by those authors, and that acute pain of the abdomen is a primary and not a secondary symptom of the disease. Dr. Hamilton positively affirms, that puerperal fever is a disease of a "putrid" nature, requiring for its treatment, wine, volatile alkali, bark, glysters, and animal jellies; and yet, in direct opposition to these theoretical views, and as if involuntarily led by the symptoms to a correct conclusion respecting the true character of the affection, he has laid down as the first indication of treatment to moderate local inflammation by purging and hot fomentations.

It is a singular circumstance that in none of the works to which we have now referred has the most remote allusion been made to inflammation of the veins, absorbents, or any of the other structures of the uterus, except the peritoneal covering, though several of them have accurately described the constitutional symptoms which characterize these morbid states.

In the epidemic fever which prevailed at Aberdeen between the years 1789 and 1792, Dr. Gordon examined the bodies of three patients who died of the disease, and in each the peritoneum and uterine appendages were inflamed. "The omentum," he observes, "does not appear to be more especially affected than the other productions of the peritoneum, which are all equally and indiscriminately affected. The dissections which I have made, prove that the puerperal fever is a disease which principally affects the peritoneum and its productions, and the ovaria. The peritoneum was inflamed, and the omentum, mesentery, and peritoneal coat of the intestines were all promiscuously affected." Venesection and cathartics were found to be the most powerful remedies. (Treatise on the Epidemic Puerperal Fever, 1795.)

Dr. J. Clarke admits that in most cases of the true puerperal fever there has been some degree of inflammation in the cavity of the abdomen, and that the uterus and ovaria sometimes partake of the inflammation. In two cases which he met with, there was an appearance of pus in the veins of the uterus. The brain was always in a natural state. In one instance only was there an appearance of disease in the chest. The effusion of sero-purulent fluid into the sac of the peritoneum was so disproportioned, however, to the degree of inflammation, that he supposed it to have arisen from another cause. Pathologists now admit that these copious effusions into the peritoneal sac are invariably the result of acute inflammation, and not of any peculiar disposition of the vessels of the part, as Dr. Clarke had supposed. (Essays on the Epidemic Disease of Lying-in Women, by J. Clarke, M.D.)

The works of Dr. Armstrong and Mr. Hey contain the histories of two epidemics, in which the leading symptoms were those which are present in cases of abdominal inflammation, and the employment of copious bloodletting, cathartics, and other antiphlogistic remedies, was attended with decided advantage. The actual condition of the uterine and other organs was not, however, ascertained by either of these writers, as they were not permitted to examine the bodies of any of those who were cut off with the disease.

The more recent works of Drs. Campbell and Mackintosh may also both be referred to, in confirmation of the truth of the pathological doctrines we shall endeavour to establish; and the statements of Dr. Gooch, if carefully examined, will be found to support rather than to weaken the force of our conclusions. As a substitute for the ordinary names, child-bed fever, puerperal fever, and peritonitis, he has employed the term peritoneal fever "to express the fact that an affection of the peritoneum is an essential accompaniment of the disease, without defining what the affection is, because it is not uniform." This term, peritoneal fever, is perhaps the least appropriate of all the terms that Dr. Gooch could have invented; for he admits that the disease may occur in its most exquisite form, and yet leave few or no traces in the peritoneum after death by which we might have been enabled to determine that this membrane had previously been the seat of the disease.

"The most remarkable circumstance," Dr. Gooch observes, "which the experience of the last few years has taught us about peritoneal fever is, that they may occur in their most malignant and fatal form, and yet leave few or no vestiges in the peritoneum after death. The state of this membrane, indicated by pain and tenderness of the abdomen, with a rapid pulse, appears to be not one uniform state, but one which varies so much in different cases that a scale might be formed of its several varieties; this scale would begin with little more than a nervous affection, often removable by soothing remedies, and, when terminating fatally, leaving no morbid appearances discoverable after death. Next above this, a state in which this nervous affection is combined with some congestion, indicated, in the cases which recover, by the relief afforded by leeches, and in the cases which die, by slight redness in parts of the peritoneum, and a slight effusion of serum, sometimes colourless, sometimes stained with blood. Above this might be placed those cases in which there are in the peritoneum the effusions of inflammation without its redness, namely, a pale peritoneum and no adhesions, lymph like a thin layer of soft custard, and a copious effusion of serum rendered turbid by soft lymph. Lastly, the vestiges of acute inflammation of the peritoneum, viz. redness of this membrane, adhesion of its contiguous surfaces, a copious effusion of serum, and large masses of lymph." (An account of some of the most important diseases peculiar to women, by Robert Gooch, M. D.)

Dr. Gooch affirms that symptoms and dissections cannot settle the question respecting the pathology of puerperal fever. "The effects of remedies on a disease," he says, "if accurately observed, form the most important part of the history. They are like chemical tests, frequently detecting important differences in objects which previously appeared exactly similar. Symptoms and dissections can never do more than suggest probabilities about the nature of a disease and the effects of a remedy on it. A trial of the remedies themselves is the only conclusive proof."

We might appeal to the works of all the most eminent writers on puerperal fever since the middle of the seventeenth century to prove that this opinion is equally erroneous as it is dangerous; and it would be easy to show, from the contradictory statements of the effects of the various modes of treatment adopted by physicians during the last fifty years, that we must have for ever remained ignorant of the true nature of the disease, if we had reasoned from the effects of remedies alone, without investigating symptoms and morbid changes of structure.

That a diffused pain of the abdomen with a rapid soft pulse not unfrequently occurs at particular seasons, without inflammation of the uterus or of any other part, or with a very slight degree of inflammation, in delicate nervous women after parturition, and that these symptoms are relieved by opiates and warm fomentations, without either general or local bloodletting, will readily be admitted by all who are conversant with the diseases of the puerperal state. That such cases are, however, if not essentially different in their nature, at least widely different in degree of severity from cases of sporadic or epidemic puerperal fever or uterine inflammation, is clearly demonstrated by the following observation made by Dr. Gooch himself:—"There seemed to be nothing dangerous in this form of disease, provided the nature of it was not mistaken and improper remedies not used, yet it so strikingly resembles peritoneal inflammation that it was invariably taken for it by the practitioners who witnessed it, all of whom possessed at least that average quantity of sense and knowledge on which the public must extensively depend."

There can be little doubt that in many instances the irregular spasmodic contractions of the uterus constituting after-pains, and irritation of the intetines, have been mistaken by superficial observers for puerperal fever, but such mistakes do not prove the identity of these affections. The results of the practice in the Westminster Lying-in Hospital in the years 1828 and 1829, referred to by Dr. Gooch, prove beyond contradiction that the cases described by him under the term peritoneal fever, were not genuine examples of low child-bed fever, as he has maintained; for of twenty-eight women who were attacked with the disease, and most of whom were treated as he had recommended, with Dover's powder and warm cataplasms, seven died, or one in four.

In investigating the morbid anatomy of this class of diseases, Dr. Gooch appears to have been satisfied with simply inspecting the peritoneal covering of the uterus; now we are strongly inclined to believe, from what we have ourselves observed, that if he had carefully examined the spermatic and hypogastric veins, the absorbents, the uterus and its appendages, with the subperitoneal tissues, he would frequently have found acute inflammation or some of its products. With the phenomena of inflammation of the deep-seated structures of the uterine organs he appears indeed to have been perfectly unacquainted, as they are not even alluded to in the course of his essay, and are generally confounded with the effects of loss of blood. The absence of increased vascularity of the peritoneum, and of lymph and serum in its sac, does not prove that the subjacent tissues are in a healthy state. That a nervous affection or congestion of the peritoneum should give rise to all the symptoms and consequences of fatal uterine inflammation, is not only highly improbable, but is wholly unsupported by facts. Had Dr. Gooch estimated more correctly the value of pathological anatomy in discovering the nature of disease, and placed less reliance on the uncertain operation of remedies, he could not possibly have fallen into so many important practical errors with respect to puerperal fever, and to some of the organic diseases of the uterine organs in the unimpregnated state.

The recent valuable researches of Andral, Luroth, Dance, Danyau, Tonellè, and Dupley, confirm in a remarkable manner the accuracy of the views we have now stated of the proximate cause of puerperal fever. In the epidemic of 1829 at Paris numerous opportunities occurred of examining the morbid appearances in those who were cut off by the disease. In one hundred and thirty-two out of two hundred and twenty-two fatal cases, purulent fluid was found in the veins and absorbents of the uterus, and in one hundred and ninety-seven some important alteration of structure was observed in the uterine organs. In a few rare cases described by M. Tonellè, under the term ataxic puerperal fever, the changes which had taken place in the uterine organs were comparatively slight, and consisted of an exudation at the neck of the uterus, and some lymph effused into the cavities of the uterine veins. In these cases the symptoms were considerably different from those commonly observed in uterine inflammation, and were probably referrible to other causes.

The whole of the preceding statements seem to warrant the following general inference, which we ventured to draw from our own observations in October, 1829: « That inflammation of the uterus and its appendages must be considered as essentially the cause of all the destructive febrile affections which follow parturition, and that the various forms they assume, inflammatory, congestive, and typhoid, will in a great measure be found to depend on whether the serous, the muscular, or the venous tissue of the organ has become affected." (Med. Chir. Transact. vol. xv. part ii. p. 405, 1829.)

We shall now proceed succinctly to describe the various changes produced by inflammation in the uterine organs subsequent to parturition;—to point out the local and constitutional symptoms by which these morbid conditions are characterized during life, and by which they are distinguished from other affections to which they bear a resemblance;—to investigate the causes and nature of this disease;—and to describe the treatment adapted to the different varieties of uterine inflammation, and the most important means to be adopted for its prevention.

The following are the principal varieties of inflammation of the uterus in puerperal women which we have observed.

1. Inflammation of the peritoneal covering of the uterus and of the peritoneal sac.
2. Inflammation of the uterine appendages; ovaria, fallopian tubes, and broad ligaments.
3. Inflammation of the muscular and mucous tissues of the uterus.
4. Inflammation and suppuration of the absorbent vessels and veins of the uterine organs.

These varieties of uterine inflammation may take place quite independently of each other, though they are most frequently met with in combination. Peritonitis seldom occurs without some inflammation of the uterine appendages; but we have found both these textures severely affected while the muscular coat of the uterus and the veins were wholly exempt from disease. The venous and muscular tissues of the uterus are also liable to attacks of severe inflammation without any corresponding affection of their peritoneal covering, though it most frequently happens that inflammation, when excited, either in the veins or muscular coat of the uterus, involves also the peritoneum. In the organs of respiration similar varieties of inflammation are observed, and the pleura, pulmonary texture, and mucous membrane lining the air-passages, may all be separately or simultaneously involved in the same attack. A similar observation may be extended to the brain and its membranes, and to the whole of the digestive organs; and the symptoms which characterize the inflammation of the different tissues of which these organs are composed, have been more accurately determined than formerly by the recent discoveries of pathological observers.

Inflammation of the uterine organs, like inflammation of the lungs and other affections of a similar character which assume an epidemic form, takes place more frequently at one season than another, and at one period the peritoneum is the tissue most commonly affected, whilst at other seasons the deeper-seated tissues are almost invariably found inflamed. That there is no essential difference between these varieties of uterine inflammation is proved by the circumstance that in the course of a few days, in the same ward of the British Lying-in Hospital, and in patients who were placed in contiguous beds during the prevalence of the epidemic, when the disease appeared to be communicable from person to person, peritoneal inflammation, uterine phlebitis, and the other varieties above enumerated, all occurred in their most marked or characteristic form. In some patients the local and constitutional symptoms indicated the presence of acute inflammation of the serous covering of the uterus; and in those cases where active depletion was had recourse to at the commencement of the attack, most frequently a speedy recovery took place. In other examples, at the onset of the disease, there was comparatively little pain in the region of the uterus, the pulse was from the beginning rapid and feeble, and the symptoms were such as to contra-indicate the use of bloodletting and cathartics. Such cases usually terminated fatally in defiance of local bleeding and the exhibition of mercury and opium, and other remedies; and on examination after death, either the veins, the muscular structure, or the appendages of the uterus were found to be the textures most frequently inflamed.

These facts prove that at different seasons different textures of the uterine organs are liable each to be affected with inflammation in varying degrees of intensity, and they enable us in some measure to reconcile the discordant opinions already quoted, both with respect to the symptoms and the treatment of puerperal fever.

1. Puerperal Peritonitis.

Morbid Appearances. — The peritoneum when inflamed becomes vascular, red, and apparently thickened, and the abdominal viscera adhere to one another by an effusion of lymph, or there is an effusion of a turbid serous fluid mixed with shreds of albumen or pus, sometimes tinged with blood, in greater or smaller quantity, into the cavity of the peritoneum. The omentum is often of a deep red colour, highly vascular, and closely adherent to the intestines, and sometimes to the fundus of the uterus, by lymph. The intestinal canal is frequently found much distended with air, at other times the sac of the peritoneum.

Puerperal peritonitis commences in the peritoneal covering of the uterus, and extends from thence with greater or less rapidity, according to the severity of the attack, to the whole peritoneum. In some cases the inflammation is confined to the uterus, and it is generally most severe in this situation, or in the parts immediately surrounding that organ. Even when it has extended to the other viscera, and affected them most severely, the peritoneum of the uterus invariably exhibits signs of recent inflammation. The lymph is for the most part thrown out in thicker masses upon the uterus than in any other situation, and this viscus seems always to suffer in the greatest degree. In the cellular membrane under the peritoneum, serum and pus are also not unfrequently found deposited.

Symptoms.—Great tenderness of the hypogastrium increased by pressure, with pyrexia, are the characteristic symptoms of the disease. In every instance which has fallen under our observation, we have found the uterine region more or less painful on pressure, and there has been febrile disturbance.

When the attack is violent, the patient generally lies upon the back, with the knees drawn up to the trunk of the body. The abdomen at first is soft and flaccid, and, except in the region of the uterus, is frequently not affected by pressure. Though an enlarged and painful state of the uterus is never altogether wanting, yet the pain often undergoes exacerbations similar to after-pains, and is frequently mistaken for these by careless observers; and the true character of the disease is overlooked until a great part of the peritoneal sac is absolutely inflamed. The whole abdomen then becomes swollen and tympanitic, and the pain either wholly subsides or becomes still more intense than at the commencement. Vomiting of black or dark green coloured fluids follows, the pulse grows extremely rapid and feeble, the tongue dry and brown, the lips and teeth are covered with sordes, and death follows at no very remote period.

The manner in which the disease commences varies considerably in different individuals. The invasion of pain is sometimes sudden, at other times the ordinary increased sensibility of the uterus which remains after natural labour or after-pains, passes insensibly into the acute pain, increased by pressure, which is the chief pathognomonic symptom of this affection. Most frequently the accession of the disease is marked by rigors, partial or general, sometimes so slight as almost to escape notice, at other times so violent as to produce severe shivering of the whole body. The cold stage, after a longer or shorter duration, passes away, and is succeeded by heat of skin, suffusion of the countenance, acceleration of the pulse and quick respiration, thirst, frequently nausea or vomiting, and intense pain across the forehead. Cough is also a common symptom of the disease. The rigors precede, accompany, or follow the increased sensibility of the uterus. In some of the most severe cases there has been no distinct rigor; but a quick pulse, hot skin, and hurried respiration have rapidly succeeded to the uterine pain. In most of the fatal cases the countenance has from the commencement been anxious and pallid, and the extremities cold.

There is no uniformity to be noticed in the appearance of the tongue in puerperal peritonitis It is sometimes entirely covered with a thin, moist, white or cream-like film; at other times it is of a deep red or brown colour in the centre, with a thick yellow or white fur on the edges.

The lochia are often entirely suppressed; in other cases only diminished in quantity. The mammæ usually become flaccid; yet in some fatal cases the milk has been secreted until a short period before death.

This variety of uterine inflammation is frequently confounded with deranged states of the intestinal canal, the irregular spasmodic contractions of the uterus which constitute after-pains, hysteralgia, and simple suppression of the lochial discharge.

In cases of intestinal irritation, (or intestinal fever as it has been named by Professor Burns, and by Dr. Marshall Hall a serious morbid affection after delivery,) the pain is from the commencement of the attack diffused over the whole abdomen; it is a griping rather than acute pain, does not commence in the region of the uterus, and is but little, if at all, aggravated by pressure. The abdomen is generally soft, puffy, and distended. The tongue is loaded; there is thirst and headach; neither the lochia nor the secretion of milk are suppressed. The febrile attack is usually preceded by evident signs of derangement of the bowels, such as flatulence, nausea, vomiting, constipation, or diarrhœa. Puerperal peritonitis is developed in a large proportion of cases before the end of the fourth day after delivery, whereas this affection of the bowels rarely appears until the end of the first week.

It is difficult in some cases to distinguish inflammation of the peritoneum from after-pains and hysteralgia. Where the pulse is accelerated, the remission of pain incomplete, the lochia scanty or suppressed, and the hypogastrium tender on pressure, we shall arrive at a correct diagnosis by considering the peritoneal coat of the uterus in a state of congestion and inflammation, and employing antiphlogistic treatment. There are few puerperal women, except those of a feeble and irritable constitution, or who have been previously exhausted by profuse hemorrhage, or some chronic disease, who are seriously injured by cautious depletion, local or general; and where death has followed the abstraction of sixteen or twenty ounces of blood from the arm, the fatal result may fairly be attributed to disease, and to the neglect of the remedy rather than to its abuse. In cases of intestinal irritation we have often found the local abstraction of blood followed by decided relief; and the same holds true with respect to the severe irregular uterine pains without inflammation, which often occur subsequent to delivery, and do not yield to the ordinary means of treatment.

2. Inflammation of the Uterine Appendages, Ovaria, Fallopian Tubes, and Broad Ligaments.

We have met with one case only where the peritoneal covering of the uterus has been inflamed whilst the uterine appendages have remained free from disease, but frequently the peritoneum has been observed slightly affected, when the appendages of the uterus have been extensively disorganized. The surface of the broad ligaments, ovaria, and fallopian tubes, when inflamed, have been found red and vascular, and partially or completely imbedded in lymph and pus. The loose extremities of the fallopian tubes have also been found of a deep red colour and softened, and deposits of pus, in a diffused or circumscribed form, have taken place within these cavities, or in their sub-peritoneal tissues. Between the folds of the broad ligaments, effusions of serous or purulent fluids have also been noticed. Numerous important changes have likewise been observed in the structure of the ovaria. Their peritoneal surface has often been seen red, vascular, and imbedded in lymph, without any visible alteration of their parenchymatous structure, or their whole volume has been greatly enlarged, swollen, red, and pulpy; blood has been effused into the vesicles of De Graaf or around them, and circumscribed deposits of pus have been found dispersed throughout the substance of the enlarged ovaria. In several cases which have come under our observation, the entire structure of the ovaria has been reduced to a vascular pulp, all traces of their natural organization being imperceptible.

The ovarium appeared in one instance which we observed to be converted into a large purulent cyst, which had contracted adhesions with the abdominal parietes, and discharged its contents exteriorly through an ulcerated opening. In another case which proved fatal, the inflamed uterine appendages, agglutinated together by lymph, had contracted adhesions with the peritoneum at the brim of the pelvis, the inflammation having extended to the cellular membrane exterior to the peritoneum, and given rise to an extensive purulent deposit in the course of the psoas and iliacus intermus muscles, as takes place in lumbar abscess.

In three other individuals, who ultimately recovered, the purulent matter formed along the brim of the pelvis made its way under Poupart's ligament to the top of the thigh, and escaped through an opening formed in that region. In all of these cases contraction of the thigh on the trunk took place, which remained for several months, but disappeared after recovery. The observations of MM. Husson and Dance prove that this is a frequent and often fatal termination of inflammation of the peritoneal coat of the uterus and its appendages. (Répertoire Générale d'Anatomie, &c. Paris, 1827, tom. iv. p. 74.) In a woman who had a severe attack of inflammation of the right uterine appendages a few days after delivery, the uterus remained low down in the pelvis, and was immovably fixed to the right side by extensive adhesions.

Inflammation of the uterine appendages being generally combined with peritonitis to a greater or less extent, it is often difficult to establish a diagnosis between these varieties of uterine inflammation. The pain is generally less acute than in peritonitis, and is principally seated in one or other of the iliac fossæ, extending from them to the loins, anus, and thighs. On pressure, the morbid sensibility will be found to exist chiefly in the lateral parts of the hypogastrium. The constitutional symptoms at the onset of the attack do not materially differ from those which mark the accession of peritonitis, being often accompanied with strong febrile re-action, which passes speedily away, and is succeeded by prostration of strength and the other changes which characterize inflammation of the muscular and mucous tissues of the uterus.

3. Inflammation and Softening of the Muscular and Internal Coats of the Uterus.

In two cases observed by us, the lining membrane of the uterus had become soft, flocculent, and completely disorganized, like the mucous coat of the stomach and intestines, in certain inflammatory diseases. In other cases not only has the internal coat been inflamed, but the muscular tissue, to a considerable depth, or even through its entire substance, has been of a dark purple, greyish, or yellowish hue, and so softened in the texture as to be torn by the gentlest efforts made in removing the parts from the body.

The peritoneum covering the inflamed portion of the muscular coat of the uterus has also been affected, and lymph has been thrown out over its surface as in simple peritonitis, or the peritoneum has become of a yellow, red, or livid colour, where no albumen has been deposited on its surface. The peritoneum has also been softened where the subjacent muscular tissue has been little affected, though more frequently there has been extensive disorganization of this latter tissue without a corresponding lesion of the peritoneum. In some cases the inflammation has affected the greater part of the muscular structure of the organ; in others it has affected only the cervix of the uterus, or the part where the placenta had adhered, and the natural appearance of the muscular fibre has been lost. In other instances deposits of pus have been observed, either immediately under the peritoneum or between the fibres of the proper tissue of the uterus.

In the different works on puerperal fever published in this country, this rapid and fatal variety of uterine inflammation has scarcely been noticed, though it has been accurately described by several German and French pathologists. Astruc, Vigarou, and Primrose state that the uterus is liable to be attacked with gangrene and sphacelus; and other authors, particularly Ponteau and Gastellier, have recorded cases where gangrene of the uterus followed acute inflammation of the organ. Boër (Natural. Medicin. Obstet. lib. viii. Vienna, 1812,) has described this affection under the term "putrescence" of the uterus, and has observed its frequent occurrence in particular epidemics. Luroth (Répertoire Générale d'Anatomie, tom. v. p. 1,) and Danyau (Archives Générales de Médicine, 1830,) have more recently published detailed accounts of this destructive disease. Among the two hundred and twenty-two fatal cases of puerperal fever observed by M. Tonellè in the Maternité at Paris in 1829, there were forty-nine in which the muscular tissue of the uterus was found softened. M. Tonellè states that "softening of the uterus," after showing itself frequently in the first half of the year 1829, and particularly about January, disappeared entirely in the months of July and August, which were characterized in a remarkable manner by the frequency of uterine phlebitis. Afterwards it began to rage anew with great violence in September and October, and again disappeared in the last two months, during which time the mortality was inconsiderable.

That the destruction of the healthy organization of the proper and internal tissues of the uterus which we have described, is the consequence of an inflammatory process, and not of any peculiar specific action, as some pathologists have maintained, may be inferred not only from the symptoms which accompany the disease, and from the usual effects of inflammation of muscular tissue in other parts of the body, but from the frequent occurrence of this affection in combination with peritonitis and the other varieties of uterine inflammation.

Pain of the hypogastrium, diminution or suppression of the lochial discharge, and rigors with rapid feeble pulse, are the most frequent symptoms of the disease. The countenance becomes pallid, and expressive of great anxiety and distress. There are often severe headach and delirium, and other symptoms of cerebral disturbance. The skin is hot and dry, and sometimes of a peculiar sallow tinge; the respiration hurried, with great prostration of strength. The tongue soon becomes foul, the lips covered with dark sordes, and occasional nausea and vomiting are experienced. The disease sometimes runs its course with great rapidity; at other times it does not terminate fatally before the end of the second week.

The diagnosis of this variety of uterine inflammation, particularly where it is complicated with peritonitis or phlebitis, which is frequently the case, is extremely difficult. The prostration of strength, the alteration of the features, which often exist from the commencement, the feebleness and rapidity of the pulse, the irregular fetid state of the lochia, are not such constant symptoms as to be considered pathognomonic, and they may arise from other causes. The most attentive consideration of the phenomena will only lead to a probability, not to a certainty as to the nature of the affection; and sometimes its existence cannot be determined during life. In all the cases of this affection which we have observed, the resources of nature and of art have proved equally unavailing in arresting its fatal course. The active inflammatory symptoms, which have usually manifested themselves at the commencement of the attack, have passed speedily away, whatever plan of treatment has been adopted, and have been rapidly succeeded by symptoms of exhaustion. Where the disease has not been complicated with inflammation of the other tissues of the uterus, the symptoms have not been such as to indicate the necessity for the employment of venesection; and in one case where a considerable quantity of blood was abstracted from the system, death soon followed. In other cases where an opposite plan of treatment was had recourse to, the fatal result seemed to be less speedy, though equally certain.

4. INFLAMMATION AND SUPPURATION OF THE ABSORBENT VESSELS AND VEINS OF THE UTERUS.

It does not appear that any pathologist in this country had observed a case of inflamed absorbents of the uterus before the month of July, 1829, when a fatal example of this disease occurred in St. George's Hospital. A woman aged 30, in an advanced stage of pregnancy, was admitted into that hospital under the care of Mr. C. Hawkins, July the 1st, in consequence of sloughing of the skin over a diseased bursa of the patella. The removal of the bursa by an operation was followed by great constitutional disturbance, and on the 14th labour came on. Two days afterward, symptoms of uterine inflammation made their appearance, and on the 18th day death took place. The pain was relieved by bleeding, but she never rallied after the attack. On examination of the body some puriform lymph was found in the pelvis, but with no increase of vascularity in the peritoneum. In the broad ligaments some fluid was also effused, and on each side numerous large absorbent vessels were discovered passing up with the spermatic vessels to the receptacle of the chyle, which was unusually distended. All these vessels, and the reservoir itself, were quite filled with fluid pus; but that in the receptacle was mixed with lymph, so as to be more solid: the vessels themselves were firmer and thicker than usual. The thoracic duct above this part was quite healthy. The uterus was scarcely contracted, and the internal surface of the lower half was soft and shreddy, and in a state of slough. The upper part, where no pus was found externally, was also healthy or nearly so, on its inner surface. (Med. Chir. Trans. vol. xv. p. 64.)

Since the occurrence of the preceding fatal example of inflamed absorbents of the uterus, four similar cases have fallen under our observation, the histories of which are related in the paper on uterine inflammation in puerperal women. (Ibid. vol. xvi. 54.)

In the magnificent collection of pathological drawings at the London University, there are several in which Professor Carswell has represented the appearances which he observed in cases of inflammation and suppuration of the absorbents in the vicinity of the uterus, of the receptaculum chyli and thoracic duct. These beautiful drawings were made by Professor Carswell in Paris, and it has been proved by the researches of Tonellè and Dupley, that inflammation of the absorbents of the uterus, of the receptaculum chyli and thoracic duct, occur not unfrequently in puerperal women, and that it gives rise to the same constitutional disturbance as uterine phlebitis. It appears indeed that these varieties of uterine inflammation are frequently combined; and it is probable that in both the purulent fluid is conveyed by the absorbents and veins into the mass of blood circulating in the arteries and veins of the body. The local symptoms of this affection are often so obscure as to escape detection during life, while the constitutional symptoms, which often resemble in a striking manner the effects produced by the introduction of specific poisons into the body, are so violent as to yield to no remedies, however early and vigorously employed.

Inflammation of the Veins of the Uterus. Uterine Phlebitis.—Inflammation of the venous system, although known to the older writers, was first fully described by Mr. J. Hunter in the first volume of the Transactions of a Society for the Improvement of Medical and Chirurgical Knowledge. The presence of purulent fluid in the veins of the uterus subsequent to parturition, was observed soon after the publication of that essay by Mr. Wilson and Dr. J. Clarke, and Meckel, but none of these authors were aware of the important fact which has recently been illustrated by numerous observations, that a large proportion of the cases termed "low child-bed fever," or "typhoid puerperal fever," arise from inflammation and formation of purulent matter in the uterine veins. Twenty-four examples of this most insidious and fatal disease have fallen under our own observation since the autumn of 1827; and from an examination of all these cases, and of those related by foreign authors, it appears that the symptoms of uterine phlebitis correspond in a striking manner with the symptoms assigned by the earlier writers to the "putrid puerperal fever," or "malignant forms of typhus" which occurs after delivery.

In women who have enjoyed good health during pregnancy, and in whom the process of parturition has been easily accomplished, uterine phlebitis occasionally commences within twenty-four hours after delivery, with pain, more or less acute, in the region of the uterus, accompanied or followed by a severe rigor, or a succession of rigors, a suppression of the lochial discharge, acceleration of the pulse, cephalalgia, or slight incoherence of intellect, with most distressing sensation of general uneasiness, and sometimes by nausea and vomiting. These symptoms, after a short duration, are succeeded by increased heat of the body, tremors of the muscles of the face and extremities, rapid feeble pulse, anxious and hurried respiration, great thirst, with brown dry tongue, and frequent vomiting of green-coloured matters. The sensorial functions usually become much affected, and there is a state of drowsy stupor or violent delirium and agitation, which is followed by symptoms of extreme exhaustion; the whole surface of the body not unfrequently assumes a deep and peculiar sallow or yellow colour; the abdomen sometimes becomes swollen and tympanitic, and some of the remote organs of the body, such as the lungs, heart, brain, liver, and spleen, or the articulations and cellular membrane of the extremities, suffer disorganization from congestion, or a rapid and destructive inflammation.

There is scarcely an organ of the body which has not been observed to become secondarily affected from suppuration of the uterine veins. The vessels of the brain sometimes become greatly congested, and lymph is effused upon the surface of the pia mater, or serum into the ventricles; portions of the brain have become softened and disorganized, or purulent infiltrations have taken place into the cerebral substance.

In other individuals, whose lungs had previously been healthy, a rapid and destructive inflammation of the pleura has taken place, or portions of the pulmonary texture have become condensed, of a dark red colour, or infiltrated with pus. In three cases, where there had only been obscure pain in the chest during life, with slight cough and dyspnœa, a copious effusion of lymph and serum was found to have taken place into the cavities of the thorax; the pleura was covered with false membranes, and portions of the lung had fallen into a state of complete gangrene. In one individual the pleura had given way by sloughing, and the right side of the chest was distended with air.

In uterine phlebitis, the mucous membrane lining the stomach has also been observed by M. Dance to have been reduced to the state of a diffluent pulp, and the substance of the spleen has been extensively softened and disorganized; (Archives Générales de Médecine, tom. 18, 19, 20;) the eyes have also become suddenly affected with destructive inflammation, and the vision has been lost many days before the termination of life. In two cases which came under our care the conjunctiva of both eyes, without much pain, suddenly became intensely red, the corneæ opaque, and the eyelids much swollen, and under their lining membrane a large serous deposition took place; lymph and pus were also effused into the anterior chamber, and in one the cornea ultimately burst. In a case related by M. Cruveilhier, the nose became black and gangrenous, yet the patient recovered.

Deposits, or infiltrations of pus, of enormous extent, also take place into the cellular membrane, between the muscles of the extremities, and often in the neighbourhood of the joints the cartilages of the joints themselves become ulcerated, and pus is formed within the capsular ligaments.

In other individuals, who have never been subject to attacks of rheumatism, severe pain is experienced in various parts of the body, more particularly in the joints and extremities, with an exhausting fever.

All these affections appear to have a common origin, and cannot be referred to any other cause than to the morbid condition of the veins of the uterus. The purulent or other secretions, formed by inflammation within the cavities of these vessels, probably produce the whole of the injurious effects now described, by entering the system and contaminating the mass of blood in like manner as poisons do when absorbed into the body.

In some cases, uterine phlebitis commences at a later period after delivery than above described, and in a much more obscure and insidious form, without pain or sense of uneasiness in the region of the uterus, or any other local symptom by which the affection can be recognised. The uterus may return to the reduced volume it usually assumes after delivery; the lochial discharge may continue; and the inflammation and suppuration of the veins, which have caused the whole of the violent constitutional disturbance and destructive lesions in distant parts of the body, may have been wholly overlooked during life. In many cases which we have witnessed, this error was committed by the medical attendant, and stimulants were liberally administered to obviate the debility supposed to exist in a specific form without any local affection of the uterine organs.

Inflammation of veins rarely takes place in any part of the body where it cannot be referred to a wound or to some specific cause externally applied to the coats of the vessels. In uterine phlebitis the inflammation cannot, it is true, be invariably traced to the orifices of those veins where the placenta adhered to the inner surface of the uterus; yet it scarcely admits of doubt that the frequent occurrence of the disease is the effect of the orifices of these veins being left open after the separation of the placenta, by which a communication is indirectly established between the venous system and the atmospheric air in a manner somewhat analogous to what takes place in amputation and other extensive wounds. Such a condition of the uterine veins, in consequence of the separation of the placenta, must be favourable to the production of inflammation, and inflammation once excited is seldom limited to these orifices, but extends with greater or less rapidity along the continuous membrane of the uterine veins to the spermatic or hypogastric veins, and from thence to the vena cava and its principal branches, which return the blood from the lower extremities.*

The effects of inflammation in the uterine veins are the formation of adventitious membranes on their inner surface, and the deposition of coagula of lymph, or of purulent matter within their cavities.

Coagula of the fibrine of the blood, which often extend a considerable distance into the uterine veins, are formed in the orifices of these vessels after every labour, and are the principal means employed by nature for the permanent suppression of uterine hemorrhage. These may be distinctly perceived for a long period after delivery, and they have a form and colour different from the coagula produced by inflammation. In opening the body of a patient four weeks after confinement, we observed distinct traces of these coagula, partially absorbed, in the muscular substance of the uterus, at the part where the placenta had adhered.

The inflammation may be limited to the veins, but not unfrequently the muscular tissue contiguous to them participates in the inflammation, and becomes of a dark red, or blackish-brown colour, and of an unusually soft consistence. The peritoneal covering may also be affected, and the usual consequences of puerperal peritonitis then ensue.

The veins which return the blood from the uterus and its appendages may be either wholly or in part inflamed: generally, however, (and this is a circumstance in the history of uterine phlebitis deserving particular attention,) the inflammation attacks the spermatic veins alone, and for the most part the one only on that side of the uterus to which the placenta has been attached; and it may either confine itself to a small portion of the vessel, or extend throughout its whole course from the uterus to the vena cava. The usual consequences of inflammation of veins are then apparent, viz. injection and condensation of the cellular membrane in which they are imbedded, thickening, induration, and contraction of their coats, and the deposition of lymph mixed with pus and coagula of blood within their cavities.

The same is the case with regard to the hypogastric veins, one only being generally affected. These are, however, more rarely affected than the spermatic veins; and this would seem to depend on the latter veins being invariably employed to return the blood from that part of the uterus to which the placenta had been attached.

But inflammation having once begun, it is liable to spread continuously to the veins of the whole uterine system, to those of the ovaria, of the fallopian tubes and broad ligaments. The vena cava itself does not always escape, the inflammation spreading to it from the iliac or from the spermatic veins. This occurrence seldom takes place to a great extent through the medium of the spermatic, the inflammation usually terminating abruptly at the opening of the spermatic into it on the right side, or of the renal on the left. If it pursue, as it sometimes does, the direction of the kidneys, the substance of these organs, as well as their veins, may be involved in the disease.

When the inflammation affects the hypogastric veins, it may extend from these to the iliac and femoral veins, and thus give rise to all the phenomena observed in phlegmasia dolens. (See the article PHLEGMASIA DOLENS.)

Uterine phlebitis would appear to result either from the mechanical injury inflicted by protracted labour, from the force required for the extraction of the placenta in uterine hemorrhage, from retained portions of placenta undergoing decomposition in the uterus, and from any of the causes which produce the other varieties of uterine inflammation.

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* A paper by the writer of this article on the structure of the human placenta and its connection with the uterus, was recently published in the Philosophical Transactions, with the object of proving that no vessels pass from the uterus to cells in the placenta, as the Hunters supposed, and consequently that no great blood-vessels are lacerated in labour.

Though a most dangerous disease, uterine phlebitis is not invariably fatal. That it often occurs in puerperal women where it is not suspected to exist during life, is demonstrated by the fact that in the spermatic and hypogastric veins of females advanced in life, calcareous concretions and various kinds of disorganizations have frequently been observed, which must have been the consequence of attacks of acute inflammation at some remote period.

Causes of Puerperal Fever. — The causes of inflammation in the uterine organs in puerperal women are often involved in great obscurity. In some cases the inflammation is distinctly referable to the injury inflicted upon the uterus by severe, protracted, and instrumental labour, the forcible introduction of the hand into the uterus to rectify the position of the child, exposure to cold and moisture, and various irregularities of diet soon after delivery. But frequently it arises in the most malignant form where none of these causes have been applied, and where we are compelled to refer it to some peculiar noxious constitution of the atmosphere, or to the communication of contagious miasmata.

It is a point of great practical importance to determine how far contagion is to be considered as a cause of the disease. Dr. Hulme maintained that it was not more contagious than pleuritis, nephritis, or any other inflammatory disease. M. Tonellé, who has recorded the history of the most fatal epidemic which has ever occurred in Paris, asserts that the idea of contagion was clearly out of the question there, for in the Maternité the women who were newly delivered had each a separate apartment, and yet were attacked with the disease, while in the sick ward of the hospital no instance of the propagation of puerperal fever ever occurred.

The evidence of M. Dugès against the doctrine of contagion is not less strong, for he states that in numerous instances pregnant women have been placed in the Infirmary, where they were surrounded by cases of peritonitis without imbibing the germ of the disease, and that still more frequently he has seen women newly delivered brought with some other complaint into the infirmaries, who did not contract the reigning malady, notwithstanding the miasmata which surrounded them.

In no instance has he observed a midwife charged with the care of two women at the same time communicate peritonitis from a sick to a healthy individual, as is reported to have happened in London; and never has this inflammation been propagated from patient to patient in the wards set apart for the reception of healthy women. (*Baudelocque*, sur la péritonite puerpérale: 8vo. Paris, 1830.)

In the earlier descriptions, however, of uterine inflammation, it is referred not only to the corrupted atmosphere of hospitals, but also to contagion. In the Dublin Lying-in Hospital, the Edinburgh Infirmary, the General Lying-in Hospital at Vienna, and in most of those in this metropolis, it has raged as an epidemic at different periods with great violence, and has appeared to be propagated by contagion. Dr. Gordon of Aberdeen states that he had unquestionable proof that the cause of the disease was a specific contagion, and not owing to any noxious constitution of the atmosphere. The disease seized such women only as were visited or delivered by a physician, or taken care of by a nurse, who had previously attended patients affected with the disease. "I had abundant proofs," he observes, "that every person who had been with a patient in the puerperal fever, became charged with an atmosphere of infection, which was communicated to every pregnant woman who happened to come within its sphere." (A Treatise on the Epidemic Puerperal Fever, by A. Gordon, M. D. London, 1795, p. 64.)

Mr. Hey observes, "If the puerperal fever of Leeds was infectious, which by many it was thought to be, it was so in a very inferior degree to that at Aberdeen; for I have known instances of free communication, by the intervention of others, between women in labour or child-bed and those affected with the disease, without any bad consequence. And, on the contrary, in many cases of puerperal fever, no channel whatever was discoverable whereby the disease could have been conveyed." (A Treatise on the Puerperal Fever, by William Hey, jun. London, 1815, p. 198.)

Dr. Armstrong observed that most of the cases at Sunderland (forty out of forty-three) occurred in the practice of one surgeon and his assistant. "It is hardly possible to prove," says Dr. J. Clarke, "that it is not infectious, but it has also arisen, as far as we can judge, as an original disease where there had been no communication with infected persons." (Dr. J. Clarke on the Epidemic Disease of Lying-in Women, 1787 and 1788.)

It is difficult to reconcile this conflicting evidence and the facts we have observed: though they have led us to adopt the opinion that the disease is sometimes communicable by contagion, yet they have not, perhaps, been sufficiently numerous and of so decisive a character as to dispel every doubt on the subject of its contagious or non-contagious nature. It is but proper to state that it has occurred in many cases in the most destructive form where the idea of contagion could not possibly be entertained.

In the last two weeks of September, 1827, five fatal cases of uterine inflammation came under our observation. All the individuals so attacked had been attended in labour by the same midwife, and no example of a febrile or inflammatory disease of a serious nature occurred during that period among the other patients of the Westminster General Dispensary, who had been attended by the other midwives belonging to the institution.

On the 16th of March, 1831, a medical practitioner, who resides in a populous parish in the outskirts of London, examined the body of a woman who had died a few days after delivery from inflammation of the peritoneal coat of the uterus. On the morning of the 17th of March, he was called to attend a private patient in labour, who was safely delivered on the same day. On the 19th she was attacked with the worst symptoms of uterine phlebitis, severe rigors, great disturbance of the cerebral functions, rapid feeble pulse, with acute pain of the hypogastrium, and peculiar sallow colour of the whole surface of the body. She died on the fourth day after the attack, the 22d of March, and between this period and the 6th of April this practitioner attended two other patients, both of whom were attacked with the same disease in a malignant form, and fell victims to it.

On the 30th of March it happened that the same gentleman was summoned to a patient, a robust young woman, seventeen years of age, affected with pleuritis, for which venesection was resorted to with immediate relief. On the 5th of April there was no appearance of inflammation around the puncture, which had been made in the median basilic vein, but there had been pain in the wound during the two preceding days. The inner surface of the arm from the elbow, nearly to the axilla, was now affected with erysipelatous inflammation. Alarming constitutional symptoms had manifested themselves. The pulse 160, the tongue dry; delirium had been observed in the night. On the evening of this day the inflammation had spread into the axilla. The arm was exquisitely painful; but in the vicinity of the wound, which had a healthy appearance, the colour of the skin was natural, and no hardness or pain was felt in the vein above the puncture. On the 6th patches of erysipelatous inflammation had appeared in various parts of the body; on the upper and inner surface of the left arm and in the sole of the left foot, all of which were acutely painful on pressure. The inflammation of the right arm had somewhat subsided. The pulse was 160, the tongue brown, dry, and furred. Restlessness, constant dozing, and incoherence. When roused, she was conscious. The countenance cold; heat of the surface irregular. On the 7th, pulse rapid; countenance anxious; teeth and lips covered with sordes; somnolence and delirium. The left arm above the elbow was acutely painful, and very much swollen. The right was but little painful, and the erysipelas had made no further progress. The patches of erysipelas on the forehead and sole of the foot had disappeared, but there was a slight blush of inflammation on the inner side of the calf of the left leg. The symptoms became aggravated, and she died on Saturday, the 9th of April.

The author of this article examined the body with Mr. Prout on the 11th, and the following morbid appearances were observed.

The wound in the median basilic vein was open, and its cavity was filled with purulent fluid. The coats of this vessel and of the basilic vein were thickened so as to resemble the coats of an artery. The inner surface of these veins was redder than natural, and at the upper part had lost its usual smoothness, but there was no lymph deposited upon it. The mouths of the veins entering the basilic were all closed up with firm coagula of blood or lymph. The cellular membrane along the inner surface of the arm was unusually vascular, and infiltrated with serum. This infiltration was to a much greater extent along the situation of the erysipelatous inflammation of the left arm; but the veins of this arm were perfectly healthy.

In the autumn of 1829 a physician was present at the examination of the body of a woman who died soon after delivery from inflammation of the peritoneal and muscular tissues of the uterus. He dissected out the uterine organs, and after inspecting them carefully, assisted in sewing up the body. He had scarcely reached home when he was hastily summoned to attend a young lady in her first labour, who was safely delivered. In sixteen hours she was attacked with violent pain in the region of the uterus; unequivocal symptoms of uterine phlebitis soon after showed themselves, and she narrowly escaped with her life.

In December, 1830, two patients in the British Lying-in Hospital, who had been attended by the same midwife, were both attacked with the same disease on the same day, and both died from inflammation of the absorbents and deep-seated tissues of the uterus. Another patient was admitted into the hospital two days after the death of the last of these women, and was examined by the same midwife to ascertain if labour had commenced. The pains were false pains, but she remained from Saturday till the Monday in the expectation that labour would come on. The pains having left her, she returned home, and on the following day was suddenly taken in labour and safely delivered before she could set out for the hospital. She went on favourably for two days, and was then attacked with the worst symptoms of inflammation of the veins of the uterus, and died in thirty-six hours.

The following statement has lately been published by Mr. Robertson, of Manchester, in Number 214 of the Medical Gazette, and it goes to support the opinion that puerperal fever is a contagious disease. From December 3d, 1830, to January 4th, 1831, a midwife attended thirty patients for a public charity; sixteen of these were attacked with puerperal fever, and they all ultimately died. In the same month three hundred and eighty women were delivered by midwives for the institution, but none of the other patients suffered in the slightest degree. Mr. Robertson states that these sixteen were all cases of inflammation of the peritoneal surface of the uterus, and that in no instance did he meet with inflammation of the veins of the uterus.

These facts point out the necessity of adopting every precaution to prevent the extension of the disease, by careful and repeated ablution, and changing the clothes after attending patients who are affected with it. They show also, whether they be considered perfectly conclusive or not as to the communicability of the affection from person to person, that we ought not to expose ourselves beyond what is absolutely necessary in examining the bodies of those who have been cut off by the complaint. When post-mortem examinations are required, they should be conducted by those who are not engaged in the practice of midwifery. We certainly owe it as a duty to our patients to act as if the contagion always existed.

[According to many observers, the miasm, presumed to arise from an individual labouring under puerperal fever, is *more* virulent than that of almost any disorder reputed to be contagious; and examples have occurred of all the patients of one partner in a medical firm having been successively attacked after delivery, when those of another partner had entirely escaped. In an epidemic puerperal fever, which prevailed in Philadelphia in 1842, the disease in one district was confined exclusively to the practice of a single physician extensively engaged in obstetrics; whilst not an instance of the disease had occurred under the care of any other accoucheur practising within the same district. Scarcely a female that had been delivered by this gentleman for weeks previously, had escaped an attack. (Dr. Condie, in *Transactions of the College of Physicians of Philadelphia for* 1842.) The arguments and the examples of apparent communication of the disease brought forward by Dr. Oliver W. Holmes, of Boston, in a recent paper on the contagiousness of puerperal fever, (*New England Quarterly Journal of Medicine and Surgery*, 1842,) taken along with other evidence, (*Amer. Journ. of the Med. Sciences*. Jan. 1843, p. 224; July 1843, p. 260; Jan. 1844, p. 19; and April 1844, p. 487,) appear, indeed, to compel us irresistibly to the belief in its contagious nature.]

Whatever conclusion we may arrive at as to the contagious or non-contagious character of the disease usually termed puerperal fever, it cannot affect the view which has now been taken of its proximate cause or essential nature, for the symptoms, morbid appearances, and influence of remedies, all incontrovertibly prove, whatever the nature of the remote cause may be, that it acts by exciting inflammation of the uterine organs.

With regard to the nature of this inflammation, it is difficult to determine whether it be of a common or specific kind. It certainly arises where individuals are not exposed to the ordinary causes of inflammation, and it often reigns as an epidemic, particularly in hospitals; and in this respect it resembles erysipelas, hospital gangrene, and other specific inflammatory diseases, which are generally supposed to depend on a vitiated state of the atmosphere. Like these diseases, too, it ceases without any assignable cause, perhaps for several years, and then re-appears in the same establishments, and is attended with the same destructive consequences.

Sporadic cases of puerperal fever are met with in all seasons of the year and in all the different ranks of life, and the disease is sometimes not less destructive when occurring in this form than in hospital during the prevalence of an epidemic.

Pouteau supposed the inflammation of the uterus to be of an erysipelatous nature, and the same opinion was maintained by Dr. Lowder and Drs. Home and Young of Edinburgh, who saw the disease in the lying-in wards of the Royal Infirmary. Dr. Gordon observed erysipelas to prevail extensively at Aberdeen in 1795, but he has not inferred from this circumstance that the peritoneal inflammation which he has so accurately described was of an erysipelatous kind, or different from common abdominal inflammation.

Dr. Abercrombie has lately described several cases of peritonitis which he considered to be allied to erysipelas. The principal pathological character of this affection noticed by him is, that it terminates chiefly by effusion of fluid, without much and often without any of that inflammatory and adhesive character of the disease in its more common form. Pinel, Bayle, Gasc, and Laennec, to whom we are so much indebted for the knowledge we possess of the anatomical characters of inflammation of the peritoneum, have traced no resemblance between the phenomena of puerperal peritonitis and erysipelatous inflammation, and it is still extremely doubtful if serous membranes are liable to attacks of erysipelas. Dr. Hodgkin has stated to us that the appearances after death in puerperal peritonitis do not differ from those observed in ordinary peritonitis in the male sex.

Dr. Whiting maintains, in his lectures, that the uterine inflammation of puerperal women is essentially different from common inflammation, and that it is of an erysipelatous nature. To establish this doctrine, it is requisite that some decided difference should be perceptible in the products of the inflammation subsequent to delivery, in the changes of structure, in the progress of the symptoms, and the effects of the remedies employed. Of the numerous dissections which we have made of the bodies of those who have died from puerperal fever, we have not discovered in the morbid appearances any thing to justify this distinction. Instead of running a definite course in spite of the application of remedies, as erysipelas does when it appears on the external surface of the body, the inflammation of the peritoneum in puerperal women is in most cases completely cut short at the commencement, if the appropriate treatment be vigorously adopted. Erysipelas in other parts of the body cannot be cut short in this manner.

The following coincidence may seem, however, to prove that there is some connection between erysipelas and puerperal fever. In the autumn of 1829, a short time before the epidemic broke out in the British Lying-in-Hospital, which led to its being closed for several months, two children died of erysipelas. Another fatal case occurred in the course of the epidemic, and on examining the abdomen we found the peritoneum extensively inflamed, with a copious effusion of sero-purulent fluid. A few days before the re-appearance of the disease in the hospital, in December, 1830, an infant died of erysipelas of the internal organs of generation and abdomen, and the same diseased state of the abdomen was observed. Another infant was attacked with gangrenous erysipelas of the extremity of the right fore-finger on the 28th of December, whose mother had been cut off on the 24th by uterine phlebitis.

Mr. Blagden has related a similar case which occurred in his practice. A midwife of the hospital had a severe attack of erysipelas of the face a few days after attending in labour a fatal case of inflammation of the absorbents and uterine appendages.

During the prevalence of the disease in the winter of 1831 and 1832, two children died from inflammation and suppuration of the umbilical vein, and in both there were patches of erysipelatous inflammation on different parts of the body. In none of the hospital attendants has erysipelas shown itself at any of the above periods, and cases of infantile erysipelas have repeatedly occurred at periods when there were no examples of puerperal fever.

Treatment.—Like inflammation of other organs of the body, that of the uterus varies greatly in severity in different cases. At some particular periods we have remarked the existence of a disposition to the disease in certain puerperal women, evinced by tenderness of the uterus on pressure, and by acceleration of the pulse, where inflammation has not been actually developed, or where it has taken place in so slight a degree as to yield readily to the exhibition of opiates, and the application of hot fomentations and cataplasms to the hypogastrium. Some physicians, and more particularly the late Professor Chaussier, have been so convinced of the advantages and necessity of employing these remedies, with the view of preventing attacks of the disease, that they have caused all their patients recently delivered to take from time to time, and at intervals more or less distant, small doses of Dover's powder, and have applied emollient cataplasms to the region of the uterus.

In cases of intestinal irritation, after-pains, and various spasmodic affections of the uterus and abdominal viscera, this plan of treatment will prove successful. In slight inflammatory affections of other organs it is not unusual for the symptoms to subside without the employment of active remedies; and from what we have observed in many cases, it does not admit of a doubt that, in the milder varieties of inflammation of the uterus, a spontaneous solution of the disease not unfrequently takes place.

But where inflammation of the peritoneal coat of the uterus is fully developed, and where the affection occurs in a severe sporadic or epidemic form, the soothing plan of treatment will prove wholly insufficient to arrest its course, and unless bloodletting general and local, and other antiphlogistic remedies be early and vigorously employed, it will in most cases proceed to a fatal termination. In the treatment of puerperal fever, the great objects we are constantly to have in view are the following: first, to subdue the local inflammation of the uterine organs; and, secondly, to moderate the constitutional disturbance which it invariably produces. In fulfilling these indications no exclusive plan of treatment should be adopted, but we ought, according to the peculiarities of each case and stage of the disease, to employ bloodletting, mercury, opium, cathartics, diaphoretics, blisters, and whatever other means we can discover to possess an influence in controlling the disease.

In no inflammatory affection of the internal organs are the good effects of bloodletting, general and local, more strikingly displayed than in the first variety of uterine inflammation — peritonitis; but the results of our experience do not confirm the accuracy of the conclusions of some authors, that in all cases by the early employment of these means we can succeed in curing the disease. It is always an affection attended with great danger, and it not unfrequently runs its course rapidly to a fatal termination, in spite of the most prompt application of remedies.

When the symptoms of puerperal peritonitis manifest themselves as before described and in a violent form, twenty or twenty-four ounces of blood should be immediately abstracted from the arm by a large orifice, and while the patient has the shoulders and trunk considerably elevated in bed. We should not be deterred from employing the lancet because the pulse is small and contracted, provided it does not exceed 110 or 115 pulsations in the minute; for in many cases the pulse has become fuller and stronger during the time the blood has been flowing or soon after, and there has been a marked relief from suffering. In all cases, if possible, a decided impression should be made upon the system, and where syncope or faintness follows the venesection, it increases the salutary effect. In no case of inflammation of the peritoneal surface of the uterus have we observed any bad consequence to result from depletion carried to this extent; and in many, from its early use, the force of the disease has at once been completely broken. [See Prof. C. D. Meigs, in introductory essay to a reprint of Gordon, Hey, Armstrong, and R. Lee, on Puerperal Fever, p. 18, Philad. 1842.]

When the attack of inflammation is violent, and when the pain is but slightly relieved, the venesection should be followed without loss of time by the application of one, two, or three dozen of leeches to the hypogastrium, proportioning their number to the urgency of the symptoms. When the leeches have fallen off, the bleeding from their bites should be encouraged by warm fomentations or by a thin warm linseed-meal poultice applied to the hypogastrium. We have never observed poultices occasion uneasiness or an aggravation of the symptoms by their weight. Care should be taken to have them frequently renewed.

At the same time ten grains of calomel should be administered in combination with five grains of antimonial powder and gr. iss or gr. ii. of opium, or with ten grains of Dover's powder; and this medicine should be repeated every three or four hours, until the symptoms begin to subside. Upwards of fifty grains of calomel have been given in many cases in this manner with decided benefit, and in two only out of one hundred and fifty-six patients has the mouth been severely affected. We have never seen the mercury in such large doses produce those symptoms of alarming weakness, and that tympanitic state of the abdomen with vomiting and great irritability of stomach, which some have represented. After the second dose of the calomel we have often exhibited with advantage a strong purgative enema, or a cathartic draught of senna and salts, repeating it also according to its effect. After the operation of the medicine in some cases, the pain of the uterus, which had been only relieved, has completely subsided.

There are few cases in which it is necessary to have recourse to a second bleeding from the arm; and where the propriety of this is indicated by a renewal of the acute pain, the quantity of blood taken away should not exceed ℥xii. or ℥xiv. However much the patient may complain of the uterine pain, if the pulse be above 120 and feeble, and if the powers of the constitution have been much reduced by the previous treatment, blood should not be drawn a second time from the arm. Should the pain continue undiminished in violence six or eight hours after the first bleeding, or still later, and the pulse be full and not very rapid, and the strength of the patient but little impaired, a second venesection, to the extent above stated, may be ordered, not only with safety but with decided benefit. It ought, however, to be remembered that much greater caution is required in prescribing the second than the first bleeding in puerperal peritonitis; and where we are not fully convinced that it is absolutely necessary, it is better to repeat the leeching than to abstract blood again from the arm. In no case of peritonitis which has fallen under our care has it appeared necessary or safe to bleed from the arm a third time, and in a very large proportion of cases one bleeding only has been had recourse to.

After the violence of the attack has been subdued, it is proper to continue the use of the calomel, but in diminished doses. Five grains of calomel, combined with the same quantity of Dover's powder, should be given every six hours, and this should be continued until the mouth becomes affected, or until the uterine tenderness be relieved. The great object in the administration of mercury is to remove the congested and inflamed state of the vessels of the peritoneum, and to prevent the termination of the complaint by effusion of fluid, when all remedies are generally unavailing. In the epidemic which prevailed in the Maternité at Paris in 1829, mercury was not employed until the last stage of the disease; and it is to this neglect, and to the almost exclusive use of local bleeding and emetics in the first stage, when active antiphlogistic treatment only could have availed, that we are disposed to attribute in a considerable degree the frightful mortality which ensued.

Where the symptoms do not indicate an attack of a formidable nature, we ought not to carry depletion so far, or to employ mercury and opium in the doses we have now recommended. In many of the cases which we have treated, one general bleeding has proved sufficient to overcome the disease, and in many the application of leeches alone, with five grains of submuriate of mercury and an equal quantity of antimonial powder, or Dover's powder, with cathartics, have subdued the complaint.

[Large quantities of mercurials have been given and extolled by some. A patient of Dr. Collins took, in the course of treatment, an ounce of calomel! and twenty grains every four hours has not been an uncommon quantity; but large doses of calomel have not proved so successful in the hands of Dr. Locock and others. (Locock, in Tweedie's *Library of Medicine*, 2d Amer. edit., p. 379: Philad. 1842.)]

Other means, besides those now described, have been recommended by different authors in the treatment of puerperal fever, such as oleum terebinthinæ, ipecacuan, digitalis, colchicum, and camphor.

Since the oil of turpentine was introduced into practice by Dr. Brenan, the most contradictory statements have been published respecting its effects. In a paper published in the Dublin Hospital Reports, Dr. Douglas observes that in the epidemical and contagious puerperal fever, ʒiii. of the ol. terebinth., with an equal quantity of syrup and ʒvi. of water, should be given three or four hours after the exhibition of the first dose of the calomel; and that after the lapse of another hour this should be followed by an ounce of castor oil, or some other briskly purgative medicine. In some instances the oil of turpentine and castor oil may be combined in one draught. The internal use of turpentine is not to be repeated more than twice in any case whatever. "In several cases," Dr. Douglas adds, "where the debility is very considerable, the local bleeding may also be omitted; and in this case a flannel cloth, steeped in oil of turpentine, should be applied to the abdomen, and allowed to remain on for the space of fifteen minutes. This external application of turpentine, without either its internal use or the aid of bloodletting, I have frequently experienced to be entirely efficacious in curing puerperal attacks; and although I have hitherto omitted to speak of turpentine for the cure of the other varieties of this disease, yet I would not feel as if I were doing justice to the community if I did not distinctly state that I consider it, when judiciously administered, more generally suitable and more effectually remedial than any other medicine yet proposed. I can safely aver I have seen women recover apparently by its influence from an almost hopeless condition, certainly after every hope of recovery under ordinary treatment had been relinquished."

We have not ventured to prescribe in many instances the internal use of ol. terebinth., either in the superficial or deep-seated inflammatory affections of the uterus; but whenever this has been done, it has not only produced a renewal of the pain, but has excited the most distressing nausea and sickness. The results of our own observations and those of the most accurate observers in this country coincide very nearly with those which are described as having taken place in the practice of Dr. Joseph Clarke: "In addition to the usual routine of practice," he observes in his letter to Dr. Armstrong, "numerous trials were made of the rectified oil of turpentine, in doses of from six to eight drachms, sometimes in plain water, sometimes combined with an equal quantity of castor oil. The first few doses were generally agreeable to the patient, and seemed to alleviate pain. By a few repetitions it became extremely nauseous, and several patients declared 'they would rather die than repeat the dose.' In more than twenty trials of this kind not a single patient recovered."

In favour of the use of digitalis, and colchicum in puerperal fever, little evidence that is satisfactory has hitherto been adduced.

Emetics.—Willis, White, and other physicians employed emetics, and more particularly ipecacuan, in the treatment of puerperal fever, before the year 1782, when Doulcet recommended the exclusive use of these remedies at the Hôtel Dieu. Most exaggerated reports of the success of his method of treatment were speedily propagated throughout Europe, and many were disposed to consider the results at the Hôtel Dieu as affording unequivocal proofs of the power of emetics to arrest the progress of the disease when occurring in the most malignant forms. Two hundred women were represented as having been saved to society in the course of one epidemic in Paris, by the administration of ipecacuan at the onset of the attack. It appears, however, from the statement of Alphonse le Roi, that the recovery of so many individuals was attributed, without any just ground, to the peculiar treatment adopted: for the employment of ipecacuan and Kermes mineral, according to him, was commenced by Doulcet in the lying-in wards of the Hôtel Dieu when the epidemic was ceasing, but these means were found wholly inefficacious in the months of November and December, and at the beginning of the following year, when the mortality was greater than in 1780, before the remedy of Doulcet was known. M. Tenon affirms that in 1786 the complicated puerperal fever was curable by no means then discovered.

From the intense pain of the abdomen, aggravated by the slightest pressure of the hand or by compression of the abdominal muscles, and from the early occurrence of nausea and vomiting in the worst cases of the disease, emetics obviously appear to be little calculated for the relief of the symptoms, and few enlightened practitioners have employed them in this country for the last forty years. Some have gone so far indeed as to declare that they are sufficient to produce inflammation where it does not already exist, and that their employment is not only useless, but dangerous and absurd.

Several distinguished continental physicians, as Hufeland, Osiander, and Desormeaux, have, however, continued to employ emetics in the treatment of puerperal fever, and have supposed that they derived benefit from their use. M. Tonellè states that M. Desormeaux first made trial of them about the end of 1828, and that great advantage resulted from it. During the greater part of the following year they were again employed, but they succeeded in only a few isolated cases, and most frequently they entirely failed; they never, however, appeared to produce any aggravation of the pain or other symptoms. A new trial was made of them after this, and they were again followed by the most happy results. At the commencement of September, 1829, in the course of a fatal epidemic, and during a cold and moist season, emetics were again had recourse to; and for the two months during which this treatment was pursued, all the sick were not relieved, but a great number were delivered from their sufferings as by enchantment, and for an instant there seemed to be a renewal of that brilliant success which had followed the adoption of this method by Doulcet and the physicians of the Hôtel Dieu. But at the end of October emetics gradually lost their influence; and towards the middle of November no advantage whatever was derived from them. In some of the successful cases related by M. Tonellè it ought to be observed, that forty leeches, and warm cataplasms, had been applied to the hypogastrium before the emetic was given, and in those where the relief was most decided the ipecacuan either produced a profuse perspiration, or acted freely upon the bowels, causing numerous, copious, and bilious alvine evacutions. It is highly probable, from the histories of the successful cases, that the effects of the treatment were referable rather to the action of the ipecacuan on the skin and intestines than on the stomach, for the relief experienced did not immediately follow the vomiting. M. Tonellè admits that where effusion or suppuration had taken place, emetics were of no avail; and he also relates a number of cases in which the application of leeches to the hypogastrium and the employment of other antiphlogistic remedies were followed by speedy and complete relief where emetics had entirely failed to procure this.

In the milder forms of uterine inflammation, (and many of the cases related by Tonellè were of this description,) it is highly probable that an emetic, which would produce a sudden determination to the skin and a free action of the intestinal canal, would relieve the congested and inflamed state of the uterus, and thus cut short the disease. We have met with no case, however, in which we have considered it safe to administer emetics in any stage of the complaint, and we cannot conceive it possible for a case to occur in which the treatment should chiefly or exclusively be conducted upon the plan of Doulcet.

The application of blisters to the hypogastrium and inside of the thighs and legs, has often been found advantageous where the pain of the hypogastrium has continued severe after the general and local bleeding. The external use of the oleum terebinthinæ has also in some cases unquestionably been followed by considerable relief of the pain; and its effect is more sudden than that of a blister.

Both general and local warm baths have been highly recommended by foreign practitioners. Where the skin was hot, the pain moderate, the strength of the patient not much depressed, the immersion of the whole body in warm water was often followed by a general perspiration and relief of all the symptoms. On the other hand they state, that when the pains were excessive, when there was great anxiety, a profuse general or partial perspiration, the strength much reduced, the respiration hurried and anxious, and the face red with intense headach, the patient could not support the warm bath, and derived no benefit whatever from it. The hip-bath was found more generally useful, and was employed almost indiscriminately by M. Desormeaux in all the different varieties of the disease.

Recolin, Dance, and Tonellè highly recommend the injection of warm water into the vagina and cavity of the uterus, by means of an elastic gum canula. These injections were repeated three or four times in the course of the day, and they not only washed away the putrid matters adhering to the internal surface of the organ, but they appeared to relieve the irritation and inflammation of the organ itself.

In many cases of puerperal fever severe irritation of the stomach supervenes in the progress of the disease, and this symptom seems occasionally to be aggravated by anodynes and saline effervescing draughts. A drachm of sub-carbonate of potash should be added to ℥v. of aquæ menth. virid. and an ounce of this mixture given every two or three hours. The effect of this medicine in allaying the irritability of the stomach has been very remarkable indeed in some cases related to us. Should diarrhœa take place spontaneously, or result from the use of the mercury, it must be moderated by opium. The starch and laudanum glyster is by far the best mode of administering the anodyne.

During the active stage of the complaint, cinchona, camphor, and stimulants are inapplicable; but when the inflammatory symptoms have been subdued, and the patient is left in a state of great exhaustion, quinine, ammonia, wine, and other stimulants sometimes produce the happiest effects in rousing the powers of the system. We cannot too strongly urge the necessity of continuing to employ these remedies, and whatever else is judged useful, whilst the slightest hope of recovery can be entertained. Some women have been restored to health where the pulse had risen to 160, and had become so feeble as scarcely to be felt at the wrist, where there has been constant delirium for many hours, and the most alarming prostration of strength. Recovery has even taken place in some cases where the abdomen has become tympanitic, and effusion to a considerable extent has taken place into the abdominal cavity. In no acute disease is it of greater consequence than in this now under consideration, that the patient should be visited by the medical attendant at short intervals, and that the effects of the remedies he prescribes should be narrowly watched.

With regard to the treatment of inflammation of the uterine appendages and of the deeper-seated tissues of the uterus itself, whether of the absorbents, veins, or of the muscular structure, the symptoms from the commencement are generally those which contra-indicate the use of general bloodletting. In cases where the re-action at the invasion of the disease has been violent, and venesection has been employed, the relief obtained has only been temporary, if at all experienced, and in some instances the abstraction of only a few ounces of blood from the arm has produced alarming syncope. Where the local pain is severe, leeches and warm fomentations seem to be the appropriate remedies; but as far as our own observations go, we are in possession of no remedial means which effectually control those varieties of inflammation of the deeper-seated structures of the uterus which we have attempted to describe. The French physicians are, however, of a contrary opinion, and are satisfied that we possess a powerful remedy, even in the worst cases, in mercury employed so as to excite salivation. In several cases of uterine phlebitis we have pushed this remedy by inunction to a great extent, and brought the system under the influence of mercury in less than twenty-four hours; yet the progress of the symptoms was not arrested, and the patients died, as others had done where the remedy had not been administered. In other cases we have employed mercury to a great extent internally, without the slightest benefit; and it may justly be doubted, from the results of M. Desormeaux's practice, whether or not it possesses the influence M. Tonellè supposes, for of forty-three cases where mercury was used as the chief remedy, only fourteen recovered. In the latter stages of inflammation of the deep-seated structures of the uterus, the great depression of the powers of the system renders the liberal administration of stimulants absolutely necessary, and in several cases of phlebitis the life of the patient appeared to be preserved by them.

The importance of the prophylactic treatment is rendered obvious by the preceding observations. A puerperal woman ought to be as careful of herself for ten days after delivery as an individual who is recovering from an attack of continued fever or inflammation of some important viscus. While the uterus can be felt above the brim of the pelvis, and the lochial discharge continues to flow, the most fatal consequences may result from exposure to fatigue or cold, and the slightest imprudence in diet. The administration of acrid cathartics soon after delivery should always be avoided, and no unnecessary pressure of the abdomen should be made. The greatest care should also be taken by the practitioner, in performing the operations of midwifery, to avoid inflicting an injury on the soft parts of the mother. The hand ought not to be passed into the cavity of the uterus but with the utmost gentleness, when the introduction of it is required to alter the position of the fœtus, or to withdraw the placenta; and portions of placenta should be prevented from remaining and undergoing decomposition in the uterus. It is impossible too strongly to condemn the practice recently recommended, in cases of flooding after the expulsion of the placenta, of passing the hand into the uterus for the purpose of compressing the orifices of the uterine sinuses where the placenta had adhered.

We cannot conclude this subject, which is unquestionably the most important in obstetrical medicine, without pointing out the necessity which there exists for a full investigation of the means best calculated to prevent the occurrence of uterine inflammation in lying-in hospitals, where its dreadful fatality has been recorded by all writers since the foundation of these institutions. From the registers of the British Lying-in Hospital, the Maternité of Paris, the Dublin Lying-in Hospital, and the tables of M. De Châteauneuf, it is proved that the average rate of mortality greatly exceeds that of establishments where individuals are attended at their habitations; and if it should ultimately appear that all precautions are unavailing in diminishing the numbers attacked by the disease, it will become a subject deserving of the most serious consideration on the ground of humanity, whether lying-in hospitals should not be considered rather injurious than beneficial to society. From what has fallen under our observation in the British Lying-in Hospital and other similar institutions in the metropolis, where the utmost attention is paid to ventilation and cleanliness, and where the wards are not overcrowded with patients, we cannot hesitate to express our decided conviction that by no means hitherto discovered can the frequent and fatal recurrence of the disease be prevented, and that the loss of human life thereby occasioned completely defeats the objects of their benevolent founders and supporters.

ROBERT LEE.

YELLOW FEVER; *Kendal's fever; Bilious remitting yellow fever, Bulam fever; Coup de barre; Mal de Siam; Fievre Matelote; Fiévre Amaril; Vomito prieto; Vomito negro; Fiebre Amarilla; Novo pestis; Typhus icterodes; Typhus cum flavedine cutis*, &c. &c.

The anomalies which this disease has been observed to present,—the absence, under the observation of one medical man, of some of the symptoms which during another epidemic had been well marked,—the fact of practitioners having observed that certain symptoms, prominent during one period of an epidemic, have at another period been totally absent;—the fact, too, of patients in the very same ward of an hospital being frequently found to labour under symptoms so variously grouped as to lead an inexperienced practitioner to believe that he had before him three or four diseases bearing little affinity to each other;—all these circumstances have thrown difficulties in the way of this disease having had a place assigned to it in nosological arrangements free from objections.

By some, accordingly, the yellow fever has been classed with continued fevers, the symptoms not having appeared to them to correspond with those laid down by nosologists as characterizing remittents; while, according to the statements of others, of whose accuracy of observation there cannot be a doubt, the disease has assumed the most unequivocal remittent form: indeed, as will hereafter be shown, there is very respectable evidence in proof of its having, on some rare occasions, assumed even the character of intermittents.

This is not the place to attempt defining what constitutes, rigorously, remittent fever: it is plain that in most countries the opinions of medical men are at variance upon the subject. The remarks of close observers go to prove how frequently remittents may be masked so as to mislead us, if not very much on our guard, as to their true character.

Those therefore cannot, with justice, be accused of much inaccuracy, who, confining themselves probably to their own field of observation, have looked upon yellow fever as belonging to the class of continued fevers; but it is important to show whether those are right who maintain that the disease bears no affinity whatever to remittents, and that it *never* assumes any other than the continued form. On this point it cannot be necessary to quote more than a few authorities of respectability. Dr. Rush, from his extensive experience at Philadelphia towards the close of the last century, may be considered as entitled to the first place; and in his account of the epidemics of 1793 and 1794, he distinctly notices remissions in several pages:—"The remissions were more evident in this than in the common bilious fever. They generally occurred in the afternoon." (Account of Epid. of 1793, p. 79.) "It," speaking of delirium, "alternated in some cases with the exacerbations and remissions of the fever." (Op. cit. p. 62.) Speaking of the second class of this fever, he says that it was attended "with obvious emissions." (Ibid. p. 82.) At p. 45 of his account of the epidemic of 1794, he says that the disease "appeared most frequently in the form of a remittent. The exacerbations occurred most commonly in the evening." In another passage, often quoted, "Never has the unity of our autumnal fever been more clearly demonstrated than in our present epidemic. Its principal grades, viz. the intermittent, the mild remittent, the inflammatory bilious fever, and the malignant yellow fever, have all run into each other in many instances. A tertian has ended in death with black vomiting, and a fever, with the face and eyes suffused with blood, has ended in a quotidian which has yielded to a few doses of bark." (Letter to Dr. Miller, New York Med. Repos. vol. vi. p. 249.) In an official report from Mr. Campbell, of the army medical department, dated from Montserrat, in 1825, he gives as his reasons for thinking that the remittents, &c. of the West Indies are grades of the same disease, that during a yellow fever epidemic at Barbadoes in 1821, he observed "the most marked difference in the type and symptoms of cases of patients from the same barrack or hut, where not the slightest doubt could be entertained of the disease being produced in both instances by one and the same morbid cause, yet so modified by physical causes, connected with the patient, as to appear quite different diseases, and certainly requiring different modes of treatment." The frequent occurrence of yellow fever in certain parts of Spain, entitles the statements of the medical men of that country to great consideration on the point in question. To begin with the late Dr. Arejula, who was so familiar with yellow fever as it appeared in most of the epidemics which have occurred in Spain within the last half century,—the writer of this article has been repeatedly informed by him that the disease frequently assumed the most marked remittent form. In his description of the Malaga epidemic of 1803, (see his work on Yellow Fever, p. 25,) he tells us that the bark was found useful during the *remissions.* At p. 71 he is clear on the subject of remissions; and at p. 139, informs us that the disease "without doubt deserves the name of remittent fever:" ("Merece sin duda el nombre de calentura remitente.") He even says, when describing a black vomit epidemic, "the termination of our remittent in *intermittent*, which also occurred in some instances at the close of the epidemic, was an indication that the disease was about to be extinguished." The recorded opinions of Dr. Velasquez of Seville are fully in corroboration of the statements of Arejula. The following physicians were contemporaries of the latter gentleman, and had witnessed some of the yellow fever epidemics of Spain: Dr. Balmis, who called the disease, as it presented itself during the Cadiz epidemic of 1800, "a putrid malignant remittent;" Dr. Flores Moreno, who describes in his work "accessions and remissions;" Dr. Alfonso de Maria of Cadiz, who is a state pensioner in consideration of his services during some of the epidemics of Spain, says, "when the yellow fever degenerated into intermittent." In the third volume of Hurtado's *Decadas*, published at Madrid, may be found a memoir relative to one of the Seville epidemics, with the signatures attached of Drs. Gabriel Rodriguez, Serafin, Adame, Velasquez, and Chichon, to the effect that "sometimes, though rarely, the fever presented itself following the type of an intermittent:" ("Alguna vez, aunque rara, se presenta la calentura, siguiendo el tipo de intermitente.") In the *Trozos ineditos* of Dr. Salva, professor of medicine at Barcelona, evidence is to be found of the disease having been observed to assume the remittent form. In conclusion of this part of the subject it may be stated that the records of the Gibraltar yellow fever epidemics furnish the following names in support of the fact that remissions not unfrequently take place in this disease,—Drs. M'Mullin and Browne, Messrs.

Sproule, Wild, Martindale, Amiel, Daw, Donnett, Humphries, Lee, and Hugh Fraser.

History of the Disease. — Previous to entering into details, it may once for all be stated that a disease is here understood in which, along with other symptoms hereafter to be referred to, yellowness of the skin, partial or general, and towards the fatal termination, vomiting of a black or dark-brown fluid, are frequent, *though by no means constant*, occurrences. As it will be necessary to refer frequently to the yellow-fever epidemics of Spain, and as, notwithstanding all that has been written upon the subject, the identity of yellow fever, as it has appeared in that country, with the black-vomit fever of the West Indies and North America, has been denied, so late as 1828, by a French physician (Dr. Rocheaux), who went to investigate the Barcelona epidemic of 1821, it may be proper here to premise that *the perfect identity* of the disease has been admitted to have been established beyond all doubt, at Gibraltar in 1828, as will be shown further on.

Among writers on yellow fever of different nations, the names of respectable men will be found who maintain the doctrine that this disease has only made its appearance in modern times on the continent of America, in the West India islands, and certain parts of Europe. In opposition to this it has been shown by others, that though in former ages, as in modern times, this disease may not have been observed to prevail epidemically in that part of the neighbourhood of the Mediterranean in which Hippocrates practised, it is not the less true that this close observer had been familiar with a fever in which the two symptoms considered by most writers as characterizing the disease (yellowness of skin, and black vomit) were sometimes present. Respecting black vomit, held as being so peculiarly diagnostic, Hippocrates says, in the twelfth section of his prognostics, that if the matter vomited, in the form of fever which he is describing, be of a black colour, it betokens ill. In the first section of his prognostics, vomiting of a black fluid is mentioned as one of the most fatal symptoms; and in the fourth section of the same book this is pointed out by him as indicative of a high degree of malignancy.

We are reminded by Humboldt that the period of the first description of a disease furnishes no evidence of its having only then for the first time appeared; and the *ensemble* of the symptoms of yellow fever being perhaps only to be found fully and accurately detailed by writers of the last century, will scarce be considered as furnishing conclusive evidence of the non-existence of similar epidemics at periods more remote. Owing to the state of medicine in former ages, and to the fact of practitioners having been so few that the sick were not unfrequently wholly destitute of aid, the exact nature of many epidemics which reigned from time to time, under the names of pest, pestilential disease, black death, yellow death, &c. has not been handed down to us. We have a remarkable proof of this in epidemics which from time to time prevailed in this country formerly, under the name of sweating sickness; for the accounts of that disease are quite unsatisfactory as to its nature. To admit that all epidemics of former ages, within certain parallels of latitude, and termed pests or plagues, were of the character of true plague, while all the epidemic fevers of modern times, which have so frequently afflicted the inhabitants of the same latitudes, *have not* possessed the characters of plague, but those of yellow fever, would be admitting what is but little conformable to the usual course of nature. Père Dutertre, one of the oldest writers on the yellow fever of the West Indies, employs the term *peste*, when detailing symptoms not corresponding with those of plague, but such as peculiarly belong to yellow fever.

To give here even but a partial view of the arguments employed by various British writers in support of and against the statement of the yellow fever having been imported into the West India islands for the first time in 1793, would occupy more space than could with any propriety be devoted to the point. Its importation to the island of Grenada in the year in question rested chiefly on the authority of the late Dr. Chisholm, who believed that he had traced, with sufficient accuracy, the origin of the fever to the ship Hankey, which had lately arrived from the island of Bulam, situated on the west coast of Africa. This statement of the importation into the West Indies of a "*nova pestis*," as it was then called, has since given rise to much controversy; but those who consult Bancroft's Essay on Yellow Fever, and a small treatise on the disease published in 1818 by Dr. James Veitch, an experienced naval surgeon, will find details of a very interesting nature, which go to prove that on the occasion in question Dr. Chisholm had certainly proceeded on erroneous data. Indeed there cannot be a doubt that, had he been better acquainted with the history of the diseases of the part of the world in which he then served, Dr. Chisholm could never have adopted the very erroneous opinion that the disease which he describes as so malignant, was one possessing new characters; for it is established by authentic historical proofs, that, long before the year 1793, a similar disease had made frequent ravages in the West Indies, as appears from accounts by Ligon, of an epidemic at Barbadoes in 1647;—by Hughes, of an epidemic in the same island in 1695; and again of epidemics there in 1720 and 1740, by Towne and Warren. Père Dutertre would seem to be the first by whom details of the symptoms and progress of this disease in the West India islands have been transmitted to us. (Histoire Générale des Antilles.) From the remarkable muscular pains often observed to take place in a patient labouring under an attack, as if from heavy blows, it was then called *coup de barre*; and Père Dutertre, considering it a new disease when he first saw it (1635), termed it "the pest unknown previously in these islands." He notices the yellowness of the skin particularly; and though he says in one part of his work that the disease was imported into the islands by "some ships," and in another page by a particular ship, La Bœuf, from Rochelle, — he says that those "were chiefly attacked who were employed in clearing the land in different islands, and were exposed to the poisonous vapours and exhalations." (Ibid. p. 81, ed. in 4to.)

Père Labat, on landing at Martinique in 1649, found the disease raging in that island, and the monks belonging to the convent of his order suffered severely. He tells us in his work that he himself had the disease twice; that people were frequently attacked so suddenly and severely that they fell down in the streets; that hemorrhages from the several natural orifices, and even from the skin occurred; and that the disease usually proved fatal within five or six days. He states that the disease was called *maladie de Siam*, from the belief of its having been imported into Martinique by a ship of war, the *Oriflamme*, "which, coming from Siam with the *débris* of the establishments which had been at Mergay and Bancock, touched at Brazil, where she became infected with the disease which reigned there for seven or eight years." (Nouveau Voyage aux Îles de l'Amérique, tome 1.) This account of the introduction of the disease into Martinique relates to the year 1688, being some years before his arrival in that island; and his statement would seem to rest altogether on the belief then prevalent as to the circumstances.

At page 337 of Dr. Bancroft's Essay on Yellow Fever, we have evidence of the existence of the disease at St. Domingo in the year 1731; and, in subsequent pages, of its having prevailed there epidemically in 1733, 1734, 1739, 1740, 1741, and 1743. The insalubrity of that island was manifested soon after its discovery; for it appears that the sickness among his men gave Columbus great anxiety. It could scarcely have been expected that any thing very precise as to the nature of the disease from which they suffered should have been transmitted to us. The latest historian, Washington Irving, merely informs us that "when they fell ill their case soon became hopeless." Reasonable inferences may perhaps be drawn from passages in old Spanish historians. Oviedo, in his "*Historia General de las Indias*," (Ed. in folio, 1547, book ii. cap. 13,) speaks of a great mortality among Columbus's people in 1494, which he attributes to the humidity of the island. He says that those who returned to Spain were of a yellow or "saffron colour;" that people finding the country so unhealthy objected to go there, (Book iii. cap. 4); and that in consequence three hundred convicts were at one time sent to St. Domingo. He adds, that if the king offered him the Indies he would not go there: M. Moreau de Jonnès* cites (Monographie de la Fiévre jaune,) one or two passages from Oviedo on the same subject, which we have not been able to verify by a reference to the edition within our reach. Further details are given by Herrera (Madrid, 1601) as to the violence, suddenness of attack, &c. of the disease which carried off so many of Columbus's men, at the time in question, in St. Domingo; and he refers to a letter (Book iii. ch. 15,) written in 1498 by Columbus to the king of Spain, attributing the sickness of his men on their first arrival to peculiarities in the air and water.

Respecting the accounts of the existence of the yellow fever at remote periods on the American continent, it would appear that Dr. Fournier Pascay, of Paris, who for several years devoted much attention to all questions connected with the disease, considers it identical with a disease referred to by Ferreyra da Rosa, in his account of Pernambuco, printed at Lisbon in 1649. In the beginning of the last century the disease, from its appearance in various parts of Spanish America, under the name of *vomito prieto*, attracted much attention; and it is particularly referred to by the historian Ulloa, who resided for some years in that country. The word *prieto*, it may be remarked, is the Portuguese or nearly obsolete Spanish term for *black*: in Spain the word *negro* is now universally substituted. The first work *ex professo* on the black-vomit fever as it appeared in South America, is probably a little pamphlet of sixty-two pages by a Dr. Gastelbondo, written at Carthagena (S. A.) in 1753, and printed at Madrid in 1755: he gives his experience of the disease during forty years; says, in the title-page, that he is about to write on a disease of frequent occurrence in that part of the world; mentions change of climate and mode of living among the causes of the disease in new comers; and says that the natives of Carthagena, Vera Cruz, &c. were not subject to attacks of the true black-vomit fever, though liable to the "*chapetonada*," a disease resembling it in some respects.

In North America the appearance of the yellow fever epidemically, at different times previous to 1793, seems unquestionable; and authorities may be cited for its appearance at Boston in 1693; at Philadelphia in 1695, 1741, 1751, and 1762; at Charleston in 1695, 1732, 1739, 1745, and 1768; at New York in 1702; and in Virginia in 1744.

We come now to the history of yellow fever in that part of Europe where its frequent appearance epidemically, within the last half century, has so justly excited the attention of the profession and of those governments who rank the investigation of such subjects among their first duties. Some writers (among whom is Sir Gilbert Blane) have stated that the first appearance of yellow fever in Spain was at Cadiz in 1764: next in 1800 in the same city; and at Malaga, for the first time, in 1803. It seems strange that, with respect to Cadiz, those writers should have overlooked the remarkable epidemics at that place in the years 1730, 1731, and 1736, as recorded by different authorities; the two first being very particularly noticed by Villalba, in his curious work "*Epidemilogia Española.*" It seems equally extraordinary that those writers should have overlooked the black-vomit epidemic which prevailed at Malaga in 1741, described by Dr. Rexano, and since frequently referred to by different authors. With respect to epidemics which are recorded as having frequently prevailed in Spain, previous to those of Cadiz and Malaga just referred to, many consider the evidence imperfect as to the disease having been, in any of them, similar in character to that under consideration; for in those days, as already remarked, all epidemics causing great mortality were called *pests*, or pestilential diseases. In epidemics called *pests*, recorded as having prevailed at Malaga in 1678 and 1679, two physicians, Drs. Checa and Molina, sent officially to inquire into the nature of the disease, pronounced it *not* plague. The writings of Spanish medical men being but little known to the profession at large, quotations from some of them on the present subject may be the more admissible. Dr. Hurtado of Madrid, one of the few modern physicians of Spain who have published their opinions freely on the subject of yellow fever, adduces proofs in support of the prevalence of the disease epidemically in former ages in that country. He quotes Dr. Garcia Suelto as being of his opinion that such epidemics appeared at periods much more remote than 1730, and cites him as stating that "the most distinguished men of the profession move as it were in a career new to them, but long known to Spaniards their countrymen. If the medical history of Spain had been more familiar to them, they would have availed themselves of the excellent descriptions and important illustrations to be found in the work of Antonio Fonseca, on the pest and contagious diseases, and on the epidemic fever of 1621." Hurtado also quotes Sebastian Nuñez, Pablo Correa, Manuel de la Cerda, and others. The frequent application of the word *atrabilis* formerly to any dark fluid ejected from the stomach, tended, no doubt, to create obscurity as to the character of diseases; and in Spain, medical men, for want of a better name, sometimes employed the words *fiebre dudosa* (fever of a doubtful nature) when speaking of the epidemic disease. Escobar is quoted by Villalba respecting an epidemic which prevailed in Carthagena in the autumn of 1648; and which, contrary to what they observed to take place in plague, was attributed to local causes. Escobar states that in his time the endemic fevers of Carthagena and Alicant sometimes became *pestilential* in the autumnal months. It appears from Villalba's work, that in 1648 other towns besides Carthagena, as Cadiz, Seville, Alicant, and Valencia, were afflicted by the epidemic; and it is remarkable that some of the writers of that period state that the disease *was carried to the West Indies* from one of those towns, from whence it was again brought back to Spain, and commenced fresh ravages at Barcelona, Girona, Tortosa, and "almost in every town in Catalonia." From this we may at least infer that, at the period mentioned, the identity of the Spanish and West India diseases was acknowledged. According to Vallalba, three formidable epidemics took place in remote times at Barcelona within a period of eighteen years—one in 1497, another in 1501, and the third in 1515; and as they prevailed in the summer or autumnal months, their identity with the modern epidemics of Spain has beeen inferred. Villalba records an epidemic at Barcelona in 1589, which lasted from June to December,—the deaths up to the 20th October having been ten thousand nine hundred and thirty-five. On this occasion the resident physicians of Barcelona maintained that the disease *was not plague*. A Dr. Porcel wrote, in 1565, on an epidemic which prevailed at Saragossa in the preceding year, and which ended in the month of December. He states that the symptoms were sometimes very insidious; that the patient seemed to be going on well,—pulse natural, skin temperate, &c.—till the fourth day, when the countenance became altered, and faintings took place, followed commonly by death: he adds that sleeplessness, extreme anxiety, (the patient rolling about the bed,) peculiar pain in the region of the stomach, and vomiting of a fluid (which he calls *colera*) of various shades of colour, took place. He notes, moreover, that the countenance became livid and yellow, (*livido y amarilla.*) The work of a Dr. Andosilla is also cited, in which he speaks of a disease under the name of *peste*, which prevailed in some Spanish towns in the autumn of 1600. He visited those towns by order of his government, and describes the disease as not having the characters of plague, but others new to him. In 1649, a Dr. Morillo, who had been employed at Marbella and other towns in Andalusia during an epidemic, went also to Gibraltar in that year, to witness an epidemic there, which, according to an old Spanish history of Gibraltar, proved so fatal that the people, losing all confidence in human means, instituted processions to the neighbouring hermitage of St. Roque, which were kept up annually in the month of August, till the surrender of the garrison to the British in 1704. There is a record of that garrison having, in the autumn of 1727, lost five hundred men by fever, but the character of the disease is not described. By a document in our possession from Mr. Hill, deputy inspector-general of hospitals, and bearing date June 13, 1832, it appears that in 1798 the forty-eighth regiment, which was under the medical charge of that gentleman, arrived in Gibraltar from England, and that soon after a severe fever appeared among the men, which carried off about one hundred of them. This fever, which he says was confined to the recruits, of which there were great numbers, "Dr. Harness, then physician to Lord St. Vincent's fleet, and afterwards one of the commissioners to the Sick and Hurt Board, declared to be precisely the same he had seen in the West Indies. In Trotter's *Medicina Nautica* it is stated that 257 deaths from fever took place in the above garrison in 1800, among the military; the average annual mortality among the military there having been only thirty-eight. With respect to Gibraltar, therefore, these facts may perhaps be considered as sufficient to establish that, previous to the remarkable yellow fever epidemic of 1804, the disease had made its appearance there to a formidable extent: indeed it is well known that, along that part of the Spanish coast, no other form of fever proves so fatal. It may be added that Dr. Monro says in his work on the diseases of armies, that, in 1799, a fever made its appearance at Gibraltar, which he considered similar to that of the West Indies.

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* A man of science, formerly a military man, who, since his service at Martinique in 1802, as aid-de-camp, has figured a good deal in the discussions relative to the contagion of yellow fever as well as spasmodic cholera, though not of the medical profession.

As the profession generally cannot be aware of the several places in Spain in which yellow fever has prevailed, we may be permitted to place on record the following list of cities, towns, and villages in which it is admitted to have appeared since 1800:—

In Andalusia.

Cadiz.
Sn. Fernando.
Puerto Sta. Maria.
La Carraca.
Rota.
Chiclana.
Ayamonte.
Medina-Sidonia.
Las Cabezas.
Los Barrios.
Algeciras.
Paterna de Ribera.
Sn. Lucar.
Arcos.
Xeres.
Villa Martin.
Espera.
Lebrija.
Utrera.
Mairena.
Cordova.
Sevilla.

Gibraltar.
Sn. Roque.
Alcala.
Ximena de la Frontera.
Espejo.
La Rambla.
Carlota.
Aguilar.
Granada.
Malaga.
Velez-Malaga.
Ronda.
Vera.
Estepa.
Antiquera.
Carmona.
Ecija.
Moron.
Montilla.
Carrana.
Los Palacios.
Villafranca.
El Archal.
Dos hermanos.
Tribujena.
Bornos.
Zara.
Almeria.
Ubrique.

Total number of places in Andalusia, 51.

In Murcia.

Murcia.
Jumilla.
Alberea.
Molina.
Cartagena.
Yelar.
Archena.
Alcaria.
Mazarron.
Las Aguilas.
Totana.
Lorea.
Zieza.
Ricote.
Ojós.
Villa-nueva.

Total number of places in Murcia, 16.

In Valencia.

Alicante.
Orihuela.
Sn. Juan.
Guadamar.
Peñacerrada.
Elche.
Alcantarilla.
Palmar.
Lebrilla.
Alhama.
Tabarca (a small island.)

Total number of places in Valencia, 11.

In Catalonia.

Barcelona.
Barcelonetta.
Asco.
St. Eloy.
Tortosa.
Escala.
Torreuela.

Total number of places in Catalonia, 7.

In Aragon.

Mequinenza.
Nonaspe.

Total number of places in Aragon, 2.

In Old Castile, 1 (St. Andero.)
In Guypuscoa, 1 (Passages.)

Total number of places, according to the best information, 89.

The above list is important, inasmuch as it must remove an impression that yellow fever has never appeared in more than a few places in Spain, and those sea-port towns. Among the places furthest from the coast where it has shown itself, are,— Cordova, seventy miles in a direct line from the sea; Montilla and Ecija, about the same distance as Cordova; Ronda, sixty miles north of Gibraltar, and at an elevation above the sea of about four thousand feet: Granada, thirty-one miles in a direct line from the sea. In these places, as well as in a great majority of the other instances, the disease appeared to a limited extent only.

Respecting yellow-fever epidemics in other parts of Europe, that described by Palloni, Tomassini, and others, as having taken place at Leghorn in 1804, is the most remarkable. We have an account, by a Dr. Kennedy, of an epidemic at Lisbon in 1736; and from the symptoms there seems little reason to doubt of the identity of the disease with yellow fever. Professor Salva of Barcelona considers a fever with yellow skin which prevailed very extensively in a district of the Canton of Berne, during a period of very extraordinary heat, in the year 1762, and of which there is some account in a volume of the proceedings of the French Academy of Sciences for 1763, as similar to the yellow fever of Spain. Some recognise this disease also in the fever with yellow skin, hemorrhages, &c. described by Frank as occurring in Hungary.

The existence of this fever with its characteristic group of symptoms, occasionally at points higher up the Mediterranean than those already mentioned, rests upon respectable authority; among others which might be quoted, Dr. Alexander, surgeon to His Majesty's forces, who has had ample experience of yellow fever in the West Indies, declares that he witnessed many deaths from the disease in Sicily, soon after the return of Sir John Stewart's army from Lower Calabria in 1806; and that while at this latter place, some cases occurred among our troops. The existence of sporadic cases of yellow fever with black vomit in England and France has been insisted upon by some persons: those referred to in the *Dictionnaire de Médecine*, vol. xxi. p. 17, as having occurred at Paris in the hot summer of 1822, seem most worthy of attention.

In turning to East India records, the mention, at p. 46 of the Bengal reports on cholera, of a fever with yellow skin, which occurred in that presidency in 1816, can hardly be held as conclusive. But we find, in a memoir by Mr. Walsh of the medical department of our army during the late Burmese war, that that gentleman, while in charge of cases of the fever prevalent in the army, was surprised by the sudden appearance of some with black vomit and yellow skin. It is recorded, as has been noticed by Dr. Johnson, in his work on tropical climates, that those symptoms appeared in a fever which prevailed in the hospitals at the Isle of Edam appropriated for the sick of the force employed for the reduction of Java in 1811.

At Sierra Leone this disease is recorded as having occurred to a remarkable extent, in the year 1823.

Connected with the history of yellow fever, it is always considered a point of very great importance to ascertain whether it be a fact that, in those parts of the world where the disease is observed to prevail epidemically, sporadic cases have occurred in ordinary years. To the mass of evidence on this point, from the West Indies and America, not one word need be added in confirmation of this being the case in those places. In Europe a few only hold out against the statement:—in England, probably not more than two or three. But of late years so much attention has been paid to the subject, that unless people be prepared to prove that symptoms, grouped together in a certain order, in conjunction with similar *post-mortem* appearances, do not always constitute the same disease, it is quite idle longer to dispute the point. Among many other French physicians, who have paid great attention to the subject of yellow fever, and who have recognised the existence of sporadic cases in Spain, are Drs. Pariset and Robert, leaders of the contagionists. In Spain we find the late Dr. Arejula, a leading contagionist in that country, and Dr. Flores Moreno, also a contagionist, admitting it freely in their works; besides Drs. Piguillem, Salva, and several other men of note. The writer of this article is in possession of such a body of evidence, drawn from registers and other authentic sources at Gibraltar, as would, of itself, place the matter beyond all doubt. In the month of April, 1829, the records of the civil hospital in that garrison were examined, and a certificate drawn up and signed by nine gentlemen, to the effect that thirty-eight cases, of which they found details duly recorded in non-epidemic years, were identical in character with the cases which occurred there during the epidemic of 1828. All those gentlemen had seen more or less of yellow fever, and some of them had witnessed two or three epidemics. There is, besides, further evidence in corroboration, by Dr. Gray, formerly physician to the Gibraltar naval hospital; (see Lond. Med. Repos., Nov. 1817, p. 417); by Staff-Surgeon Glasse; (see Sir W. Burnett, on Yellow Fever, 2d edit.); by the late Dr. Hennen, inspector of hospitals, in his official reports; by the testimony of medical officers of the Ordnance, the 12th, 23d, 43d, 64th, and 94th regiments, who saw several cases possessing the true character of yellow fever at Gibraltar, either before or since the epidemic of 1828.

The history of yellow fever cannot be dismissed without briefly touching upon its appearance from time to time on board of ships. It cannot be expected that where space is, as here, necessarily limited, all the cases of this kind of which records exist, should be noticed. In 1726 great havoc was made in the fleet of admiral Hosier, lying off Portobello, by a disease alleged to have been yellow fever. In 1741, Admiral Vernon's fleet suffered from it off Carthagena, (S. A.) In 1742, the disease broke out in the same fleet off Portobello. In 1776, the Spanish ships Angel and Astrea suffered from the disease on their way to the West Indies. It broke out in the squadron of the Spanish Admiral Solano, in 1783. In 1785, in the Spanish ship Sn. Ildefonso. In 1793, in the Sn. Lorenzo, one of the ships of the Spanish Admiral Aristobal, bound from Cadiz to the West Indies. In the same year in the squadron of the Spanish Admiral Borja. In 1794, on board His Majesty's ships Bedford and Kent. In 1795, on board the Hussar frigate on the American coast. In 1801, on Board the ship Penelope, carrying Irish emigrants to New-York. In 1802, in a French fleet from Tarentum, bound to St. Domingo. In 1803, on board the Hibbert on her passage from Portsmouth to New York. In 1805, in the fleet of the Spanish Admiral Gravina. In 1807, in the Phebe in the West Indies. In the same year in a French squadron in the Bay of Cadiz. In 1808, on board the French brig of war, Palinure. In 1813, in an English vessel which arrived at St. Domingo, from England, as stated by Dr. Pinedo. In 1814, in a flotilla of Spanish revenue cruisers ("*guarda-costas*.") Since this period it appeared (See Wilson on Yellow Fever, p. 92) in the following ships of war, on the West India station: Iphigenia, Wasp, Tribune, Sapphire, Scout, Tamar Bustard, Thracian, Rattlesnake, Lively, Isis, Scylla, Pylades, and Ferret. But the instances which of late years have attracted much attention, are those of the Pyramus, in 1822, in the West Indies;—of the Bann, in 1823, on the African station; of the Spanish merchant-ship Donostiarra, in the same year, in the port of Passages in the Bay of Biscay; and of His Majesty's ship Blossom, in 1830, while engaged in surveying the Honduras coast.

Symptoms.—In no disease do symptoms appear to take a wider range than in yellow fever; and, on this account, it is usually considered necessary to speak of two or three, or even of four forms of the disease.

In the mildest form the febrile excitement may not proceed beyond that of mild synochus; indeed experience during epidemics warrants the conclusion that an individual, especially if a child, may pass through the disease with no more than a slight feeling of indisposition for a day or two. In epidemics of ordinary severity such mild attacks may occur in the proportion of one to ten or twelve of the severer grades; and their occurrence will usually be found more frequent as the end of the epidemic season approaches.

In a well-marked case, and in which premonitory symptoms (as *malaise* or slight headach) may or may not take place, the symptoms most commonly present are,—rigors, nausea, frontal, but especially supra-orbital headach, the conjunctivæ injected, and the eyes have a peculiarly brilliant appearance; aching of the calves of the legs and of the knees, more marked than in other fevers, and the rachialgia often quite intolerable. The loaded tongue, as if covered with paste, has been mentioned by authors; but, in our experience, a perfectly clean tongue has not unfrequently been observed in a most dangerous attack. There may be a remarkable trembling of this organ, or it will sometimes be swollen, and have its apex turned downwards. The most characteristic appearance, however, of the tongue, in yellow fever, is the pasty surface, with red edges and apex. In a young and vigorous subject, the heat of the skin may be of the pungent nature described by some writers on fever; but in yellow fever a temperate skin is far from being always an indication of a mild attack. An *impacted* state of the skin is always indicative of danger. Sensibility of the epigastrium frequently exists; but even in the severest cases free pressure can often be employed without an indication of pain being produced by it. Jactitation is a remarkable symptom: the patient tosses his head and limbs about incessantly, unable to procure sleep in any position, or relief from the feeling of distress by which he is oppressed. In other instances, the patient, while lying pretty tranquilly, starts when approached, and seems terrified when spoken to. He draws deep inspirations; and sometimes, though languid, he will beg to be allowed to get out of bed, in the hope of experiencing relief. From the commencement there is a tendency to costiveness; never, as far as we are aware, to an opposite state of the bowels. As the disease proceeds in its course, the irritability of the stomach usually becomes one of the most remarkable as well as indomitable of the symptoms:—there is often, indeed, little use in directing medicine or drinks, even of the most delicate kinds and in the smallest quantities, as all are instantly rejected; and, altogether without resources, we often find ourselves obliged to look on in the expectation of the arrival of a tranquil moment, when we may again venture on the exhibition of something. Our experience during two epidemics (one in the West Indies, and that of 1828 at Gibraltar) by no means bears out the statement of others as to the *bilious* appearance of what is vomited in the progress of this fever: after having paid the closest attention possible to this point, we must, on the contrary, state, that with the exception of the black-vomit stage, and at the very commencement of the attack, what is thrown up consists of the ingesta and a glairy fluid. Bile is also *usually* absent on an inspection of the stools and urine. But it must be recollected that we are speaking of a disease which, like spasmodic cholera, furnishes exceptions to almost every rule which can be laid down regarding it; and with respect to bile in the urine we find it occur in some cases, as distinctly admitted by a commission of Seville physicians, in their report of the yellow fever epidemic in that city in 1819. (Hurtado's Decadas, vol. iii. p. 121.) They mention that they found the urine "yellow, and paper dipped into it was tinged the same colour."

The stage of excitement, with occasional rigors, may vary as to duration, from forty-eight to seventy hours; when the pulse, which up to this time may have been full, rapid, and more or less firm, begins to give way; the eyes lose their brilliancy; the patient in some instances becomes so faint as to be unable to sit, unsupported, on the night-chair. The attack sometimes terminates fatally at the end of the third day; in which case we have quickly added to the foregoing symptoms, a peculiar acrid or *burning* sensation in the stomach extending not unfrequently to the œsophagus; the temperature of the surface, but especially of the extremities, falls rapidly; no urine is secreted; the stools may or may not be very dark; the features shrink; a distressing degree of singultus takes place; and finally, the black vomit. More commonly, however, the disease, in epidemics of ordinary severity, does not proceed so quickly to a fatal termination, but will extend to the fifth, sixth, or seventh day; indeed fatal terminations at periods much later are not uncommon; and a few extending to the twelfth and fifteenth day have passed under our own observation. Yellowness of the skin, varying from the lightest to the deepest tinge, may occur as early as the third or fourth day; but it oftener occurs at a more advanced period. This yellowness is usually first perceptible in the line of the large vessels of the neck, next over the chest, and then over the whole body,* the adnatæ becoming, at the same time, more or less yellow. From about the fourth day hemorrhage, most commonly from the gums and nose, is liable to occur; but it has been observed to take place from every orifice of the body, and even from the skin, and from under the nails. As this stage proceeds, the tongue becomes so black, shrunk, and incrusted, that it has the appearance of having been seared with a hot iron; the pulse becomes more feeble, irregular, and occasionally intermits; the stools are dark and gelatinous in appearance; the singultus becomes most distressing; and, finally, when the symptoms follow this order, coma not unfrequently precedes death. From observations made during the last Gibraltar epidemic, it would appear that in those cases where copious hemorrhage takes place from any of the natural orifices, black vomit and suppression of urine are much less likely to occur.

Where neither yellowness nor hemorrhage supervene, we may have a different group of symptoms set in, which lead to a fatal termination in a shorter time. The countenance of the patient may not indicate great danger; but he is observed to lie, his limbs being uncovered, with his head hanging over the edge of the bed: he seems sensible when spoken to, and will assist to arrange the bed-clothes, which soon again become displaced. The tongue is dry, furred, and brown or yellow at its base; its palpillæ are often separated in a remarkable manner, and deep fissures sometimes take place in its substance. The pulse is feeble and intermitting; the stools are usually dark. The irritability of the stomach is more remarkable in those cases. In some, slight spasmodic twitches about the mouth may be observed immediately preceding death. In a few instances trismus has occurred. In the *early part* of the last Gibraltar epidemic, besides singultus, suppression of urine, and black vomit, a very remarkable symptom sometimes took place in these cases a few hours before death; viz. a loud, incessant, and monotonous wailing, extremely distressing to all within hearing; the patient, during the time, lying covered up, apparently insensible to every thing, and incapable of replying distinctly to questions.

Another form is where the deadly nature of the attack seems to be marked in strong characters in the countenance of the patient from almost the very commencement. The features seem shrunk, *decomposed;* the face has a mottled or ash-coloured appearance. The look is sullen and the eyes are of a dull red colour. The tongue possesses in this, more frequently than in any other form, the appearance pointed out as being most characteristic of the disease. There is usually little or no vascular excitement, and the surface is temperate,—sometimes below the natural standard from the commencement of the attack. The patient will perhaps say that he does not feel much the matter, and will move about as we converse with him; indeed he often possesses a surprising degree of muscular energy. Here hiccup generally sets in soon, with lividity and coldness of the extremities, only equalled by that which occurs in the worst forms of cholera. The patient does not complain of being cold. In this state the pulse can scarcely be felt at the wrist; sometimes not at all. The stools are sometimes of a light colour, small in quantity, and lying flat in the vessel. The ears and extremities assume a leaden colour: suppression of urine takes place, and the black vomit, with the acrid sensation in the stomach, may quickly set in, which close the scene, not unfrequently within forty-eight hours. But where the two symptoms last mentioned do not occur, life may be protracted to three days the extremities being for a great part of the time so cold and clammy as to give a shock to those who touch them; and though they lie seemingly ungoverned, the patient is able to move them as he may be ordered. He will lie quiet for hours perhaps, but obtains no sleep; and on being approached, the eyes are found wide open. When asked a question, he seems to understand its meaning, and usually gives a pertinent answer; but he is generally taciturn unless spoken to. In those cases we seldom find that there is any yellowness during the attack.

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* In Dr. Bancroft's Essay some interesting remarks will be found on the yellowness of the skin in this fever.

By a few authors on yellow fever two symptoms have been mentioned as liable to occur, which have not presented themselves under our observation — intolerance of light and petechiæ. The following symptoms, occurring in typhus, are not, as far as we are aware, liable to present themselves in the disease of which we are treating:— meteorism; the eruption termed *sudamina;* the contraction of an upper extremity; tinnitus aurium; the involuntary passing of the fæces and urine; deafness; sores about the mouth. Bed sores are not liable to occur, as in other fevers in those cases where relapses take place, or where the disease runs a course of many days. Furious delirum is not likely to occur; and though mild delirium and coma not unfrequently take place, the mental faculties in a great proportion of the cases, remain entire to within a short time of the fatal termination. Excoriations, causing great distress, have been observed to take place on the scrotum, penis, and about the anus. The statement as to the occurrence of gangrene on blistered surfaces has in no one instance been verified in the experience of the writer of this article. In some cases he has met with hemorrhage from leech-bites, very difficult to suppress. Anthrax is stated by a few writers to have been occasionally met with in yellow fever.

Infiltration of venous blood into muscular parts has been noticed as occasionally occurring in the disease in the West Indies; and the epidemic of 1828 at Gibraltar furnished a few cases in which a similar occurrence took place.

The observations under a former head preclude the necessity of entering here upon the remittent form of yellow fever.

Sequelæ.—With the exception of a very few instances, we find that, in the records of yellow-fever epidemics, chronic organic affections have not been much referred to. Dr. Alfonso de Maria has recorded that, after a Cadiz epidemic, several who had passed through the disease were recommended to go to St. Lucar in consequence of the visceral diseases which followed; and Mr. Munro, in his official report of the disease as it occurred in the seventy-seventh regiment, at Falmouth, Jamaica, in 1827, states that "in cases of recovery from this form of the disease, the patient was generally a considerable time afterwards affected with some organic complaint, either of the lungs, liver, spleen, or other viscera." It may be a question how far some observations of Dr. Rush, regarding the Philadelphia yellow fever of 1794, apply to this point; that "the moderate degrees of it were of so chronic a nature as to continue for several weeks when left to themselves."

Diagnosis.—From what has been said, it must be evident that great difficulties stand in the way of affixing pathognomonic symptoms to yellow fever; it has even been observed, especially in regard to children, that those very slight attacks which occur not unfrequently during epidemics, and in which we have not a single well-marked symptom of fever, seem to give the *admitted degree* of immunity, during subsequent epidemics. As in some other diseases, we must rather point out those symptoms usually considered characteristic of an attack, than refer to any as invariably present. Nausea and vomiting, especially after the first twenty-four hours, are far more constantly present and more distressing than in any other form of fever; the quantity ejected is sometimes considerable, though nothing had for some time previous been taken into the stomach: and in this last case what is thrown up, until perhaps about the fatal termination of the disease, is usually colourless, as if simply a secretion from the stomach. Though, as is well ascertained, a black or dark-brown fluid is now and then vomited in other diseases, there can be no question of this symptom forming, at the fatal termination of cases, a very leading character in the great majority of yellow-fever epidemics. It is necessary to speak thus as to the *majority* of epidemics, for here, as in almost every thing else which can be mentioned respecting the disease, remarkable exceptions occur; as, for instance, in the 84th regiment at Jamaica, in the epidemic there of 1827, when, according to the surgeon's official report, the black vomit rarely appeared in the fatal cases: and at Gibraltar, in the epidemic of 1814, when the same was observed there among the military. In young robust persons, the suffused and red appearance of the eyes is held to be among the common signs of the disease; but a much more unequivocal one is, in others more advanced in life, an intense redness of the adnata, but without any brilliancy, the natural secretions of the part being suppressed and giving to the countenance rather a ferocious expression. The red, or, as it has been called by some, crimson border of the tongue ranks among the most characteristic signs in the first stage of the malady. Jactitation is of more frequent occurrence, and more severe in degree than in any other disease, spasmodic cholera not excepted. In the forms in which the excitement runs high, the aching across the loins, of the calves of the legs, and of the eye-balls, is more severe than in any other form of fever. Though, on particular occasions in the West Indies, yellowness of the skin has been spoken of as being "as often absent as present," the propriety of considering this as a symptom to be looked for in the majority of cases is evident enough from the name given to the disease by so many writers of different countries. This yellowness may be partial or general and may vary from the light lemon colour to deep ochre-yellow.* Hemorrhages from the different orifices must also have a prominent place.

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* Regarding yellowness, it is quite inconceivable how any writer laying claims to the smallest knowledge of this disease could have placed a very light or lemon yellow as the true *diagnostic* colour; for nothing is better known than that the skin may assume a very intense yellow; so that the perspiration is even sometimes found to stain the sheets, as is remarked by Flores Moreno, and was observed in a few instances at Gibraltar in 1828.

Suppression of urine is, in desperate cases, infinitely more common than in any other form of acute disease, spasmodic cholera perhaps excepted; and it is probably only in this last disease that we have, as frequently as in yellow fever, the acrid or "burning" sensation in the region of the stomach so peculiarly distressing. It has been attempted to set up, as diagnostic of yellow fever, an excruciating headach confined to the orbits and forehead, without extending to the temples, but the general application of this as a guide has been justly questioned.

[In the severe and fatal cases, much difficulty can scarcely exist in diagnosticating yellow fever, especially should there be a manifest epidemic prevailing. The great irritability of the stomach, the black vomit, and the yellowness of the skin are pathognomonic symptoms. In mild cases, however, where there is no declared epidemic, difficulty may be experienced. In the mild cases that occurred in the epidemic at Gibraltar, which Dr. Gillkrest witnessed, all the more or less characteristic symptoms were wanting. (Louis, *on the Yellow Fever of Gibraltar*, of 1828, translated by Dr. Shattuck, Jun., p. 291: Boston, 1839.)]

Prognosis. — The following are among the unfavourable symptoms:—the *early* appearance of yellowness, especially a shade of it similar to what occurs in patches in ecchymosed parts; intense rachialgia; incessant vomiting and jactitation; deep sighing; intermissions or remarkable depression of the pulse; aching of the eye-balls; singultus, and, according to some observers, the appearance of a few drops of blood from the nose at a very early period of the disease. Opposed to some of these may be reckoned among the alarming signs, a feigned gaiety, or an assurance on the part of the patient that he suffers little, at a moment when a practised eye can discover cause for apprehension.

A fatal issue may be looked forward to when the patient, although in possession of his faculties, lies for the most part on his back, in a state of collapse; his limbs pulseless, clammy, and stricken with a degree of coldness considerably below that which is found to take place in a corpse under a similar atmospheric temperature; while probably he complains of agonizing internal heat, and casts off the bed-clothes incessantly. When, on the contrary, the patient lies on his side, completely enveloped in the bed-clothes, the temperature not remarkably reduced, labouring under no very striking symptom, indifferent to passing events, and annoyed at being disturbed, but answering questions rationally; in this case, it is often supposed that the patient is enjoying a tranquil sleep; where the acrid sensation spoken of takes place, and which sometimes extends along the course of the œsophagus to the fauces:—when we have, as sometimes happens, from the very commencement of the attack, a knitting of the brows, a sort of scowling, *sinister* look, with the remarkable redness of the eyes, and what may be called a mottled or *party-coloured* skin, in which livid, light olive, and ash-coloured patches of all sizes may be observed shading into each other:—where a loud, monotonous wailing takes place, or a violent, sonorous heaving of the chest, amounting to the degree of dyspnœa liable to occur from extensive organic lesions:—when lividity of the ears and hands takes place, or livid blotches or swellings on various parts, from the infiltration of venous blood into the cellular tissue: — when we have trismus, or slight spasmodic twitches about the mouth, or long-continued singultus: — when we have profound coma,* or the small whitish stools referred to, or suppression of urine, or, finally, black vomit. With regard to the occasional recovery of patients labouring under any of the foregoing symptoms, the statement in reference to black vomit is perhaps the most worthy of attention; the general impression being that it is *invariably* a fatal symptom. Dr. Rush, in his account of the Philadelphia epidemic of 1793, states that "many recovered who had this coffee-coloured matter." (Page 54.) Mr. Amiel, (now surgeon to the 12th regiment, who has witnessed three yellow-fever epidemics at Gibraltar, states that he met with two instances in children where recovery took place after the appearance of black vomit. Surgeon Callow, of the 84th regiment, says, in his official report to the Army Medical Board, relative to the yellow fever as it appeared in his corps at Fort Augusta, Jamaica, in the year 1827, that the black vomit "is not invariably fatal; examples more than one in my regiment are now living." He states that Captain Pack recovered eventually, "though he had a vomiting of coffee-coloured fluid for twelve hours." Dr. Bone, deputy inspector-general of hospitals, who has had an experience of many years in the West Indies, is very precise upon this point in an official report relative to an epidemic at Barbadoes in 1821. He there not only refers to some cases in which recovery took place after having vomited black ("China-ink coloured") fluid, as well as "flaky brown blood, usually the precursor of the real black† vomit," but enters into minute details relative to two cases, ultimately terminating favourably, where the fluid ejected possessed the most unequivocal characters.

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* It seems strange that *Dr. Boisseau*, the erudite author of the "*Pyrétologie Physiologique*," should, in his last edition (1831), have given the integrity of the mental faculties as invariable in yellow fever; for, although he is a good deal borne out by the statements of Deveze and some others, it is nevertheless certain that in protracted forms the opposite is sometimes the case.

† Dr. Bone, who seems to have paid much attention to the examination of the fluids ejected from the stomachs of persons labouring under yellow fever, describes them thus: — "1st. The contents of the stomach at the invasion of the disease. 2d. The fluid drank, mixed with green or yellow bile. 3d. The fluids drank, without any admixture or change. 4th. A fluid like indigo or China ink, brought up with some straining: I suppose it to be bile, for it coagulates with spirits of wine. 5th. A brown fluid, resembling urine in appearance. 6th. Brownish blood, not flaky, proceeding from the fauces and gums, and perhaps partly in some cases from the pulpy cardiac opening of the stomach. 7th. Brown flaky blood, mixed with mucous matter, proceeding from the gums, fauces, and stomach, usually the precursor of the real black vomit. 8th. The *real black vomit*, which also is blood altered by its passage through the vessels of the villous coat." At Gibraltar, in 1828, we were led to consider "*black vomit*" under the following forms: — 1st. In thin flakes or portions of a brownish black colour, floating, like broken up wings of a butterfly, in a glairy fluid, or in a fluid resembling an infusion of black tea. 2d. A perfect resemblance to a mixture of soot and water, or to the contents of a coffee-pot when the clear part of the coffee has been poured off. 3d. A homogeneous, intensely black substance, having a jelly-like consistence, and adhering in great abundance sometimes to the mucous coat; this, though never *vomited up*, and therefore more properly belonging to the *morbid appearances*, it is thought may not be altogether out of place here: — it is rarely found in the stomach, the intestines being much more commonly its seat. A simple test of true *black vomit* has been proposed, which is dipping into it white paper, which it does not tinge.

Recovery may be hoped for, even where hemorrhage the most profuse takes place from one or more of the natural orifices, if the number of patients be not so overwhelming as to prevent the possibility of allotting to those who are in such a state incessant care and good nursing. Reasonable hopes may be entertained, when in the ordinary forms of the disease, the pulse is not found to give way remarkably about the end of the third day. Distinct remissions have been remarked as favourable. Surgeon Callow says, "if a distinct remission occurs, it generally proves a favourable indication." If the skin, during the first forty-eight hours, maintain an equable temperature and softness, there is great probability that symptoms of a very severe character will not set in. Serenity of countenance and a facility in moving the eyes are favourable indications; but, with respect to the first of these, it is especially to be remarked that traits, often so light as to escape inexperienced observers, are of high moment; and on this account additional advice should be resorted to whenever practicable, even in what may seem a very mild case. The miliary eruption noticed by certain Spanish writers is to be regarded as favourable; so, in a high degree, are some hours of sleep not broken in upon by vomiting; and so are, as perhaps need scarcely be mentioned, dejections of a proper colour. The restoration of the moisture and bulk of the tongue from the remarkable dry and *withered* state often occurring in the protracted forms, is one of the most promising signs. Whatever be the colour of the urine, its secretion in due quantity is always a favourable point, though not to be considered as one of the most prominent indications of a favourable issue.

On the whole, the yellow fever is considered the most *insidious* of all fevers; for it is known that in persons sitting up in bed amusing themselves, and apparently in a favourable state, the black vomit has suddenly appeared, quickly followed by death, to the utter astonishment of the medical attendants.

Morbid Appearances.—1. *In cases of extreme malignity, and terminating rapidly* (*concentrated form,—congestive form*). The party-coloured appearance remarked as existing during the attack in this form, more strongly marked, the lividity being more prominent, especially in the most dependent parts; and a pale yellow line, mingling with the other colours, can be observed from about the nose to the pubis. The ears, hands, and arms quickly become of a brown-black; the palms being equally dark with the backs of the hands. The penis and scrotum also become particularly dark. This appearance of the body has sometimes given rise to a hasty conclusion that rapid decomposition had taken place; but it does not appear, from observations made during a long time in dissecting-rooms, that the odour of putrefaction takes place sooner after death from yellow fever than in other cases. *Cellular tissue*, unhealthy in appearance, but having no yellow tinge. *Muscles*, dusky, and softer than natural; so that they may usually be broken down by pressure between the fingers. *The heart*, same appearance as other muscles. *Liver*, change of colour seldom very remarkable; but light olive patches are sometimes observable, which would seem to indicate that a change similar to what is common in the more protracted forms of the disease had commenced in this viscus. No trace of inflammation, by adhesions, abscesses, &c. Congestion, though not always present in a remarkable degree, has been observed. *The gall-bladder*, remarkably diminished in size, (sometimes shrunk, and in other instances greatly attenuated); altogether empty, or only containing a *minute* quantity of bile of a deep orange-red colour, or of green bile, or of serum, or, more rarely, of pus; its mucous lining in some instances highly injected with blood of a bright red colour.* *The cystic duct*, in a few instances so completely closed that a probe could not be passed through it.† *Peritoneal surface*, free from adhesions or other evidence of inflammation. *Stomach*, free from what, in the present day, is admitted by the best authorities to be evidence of inflammation; mere redness, whether in streaks in various directions, or in stellated patches of various sizes, has been on several occasions remarked in the mucous membrane, in the same degree as it is observed to occur in chronic or other diseases, or in cases of accidental death, where there is not the remotest suspicion of gastritis. Spots of a purple colour are much more common than those of a bright red. A perfectly pale state of the membrane is far from being of rare occurrence. Dark streaks or patches in the mucous membrane are not uncommon, and would give an impression of their being occasioned by blood, changed in the capillaries to *black vomit*, in its progress to the surface. This appearance no doubt it is which has given rise to the opinion that gangrene of the stomach occurs in yellow fever; but the most careful examinations at Gibraltar, in 1828, fully bear out those observers in America, the West Indies, and Spain, who deny not only that gangrene does take place in the disease under consideration, but also that any lesion whatever of the stomach is to be traced. As the same may be said, very confidently, with respect to the other parts of the body, it would be unprofitable to enter more into details upon this part of the subject; and it need only be observed further that here the contraction of the bladder has appeared to be constant.

2. *Where death takes place after the more ordinary forms of the disease.*—Little *lividity of the skin*, except in dependent parts. Where no *yellowness* has appeared during life, a little may now be observed about the eyes, at the sides of the nose and mouth, along the course of the large vessels of the neck, and about the chest. Where yellowness had existed during the attack, it now becomes more intense and general, and extends to the fat and cellular tissue; but it is proper to state

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* It is to be remembered that, though these appearances were so constant in the examinations made on an extensive scale at Gibraltar in 1828, they have also been occasionally found by pathologists in other fevers, and even in phthisis.

† This, as is well known, occurs in other diseases: if the peculiar valvular as well as spiral structure of the duct be not kept in view, we shall often be misled in supposing that actual occlusion exists.

that the assertion as to the pericardiac fluid and that contained within the ventricles of the brain being sometimes tinged yellow, has not been verified under the observation of many who have had ample experience in this disease. *Muscles*, their natural colour and firmness little altered. *Peritoneal surface*, free from adhesions or other evidence of inflammation. *Liver*, presenting remarkable changes of colour. Sometimes (as during the greater part of the Gibraltar epidemic of 1828) the colour has been a pale olive, or mixture of green and yellow, usually taking place uniformly throughout the whole substance of the organ, in some rare instances alternating with dark green, in regular strata, and occasionally taking place in the left lobe only; the liver observed, at the same time, to be studded, or punctuated, very thickly, with minute spots of bright red, being, perhaps, the granulated structure retaining its colour. The colour of the liver is, in some cases, especially in women and children, lighter than here described. In children it has been observed, after having been merely put into water for a moment, to be as pale as box-wood. Another change of colour is to reddish brown, compared by some (Arejula, &c.) to that of red Peruvian bark, and by others to the leaves of an autumnal scene: this was almost the only change of colour which presented itself during the latter part of the epidemic season of 1828 at Gibraltar. Portions of the liver washed, pressed, or bruised in a mortar, did not give out colouring matter, whatever the shade might have been; and portions of the light olive coloured have remained unchanged by long immersion in spirits of wine. Little or no blood exuded from this viscus when deep incisions were made; and when broken up between the fingers, the impression given was what is termed *friability* of texture. No trace of bile has been observed in the pores on the occasion just referred to, nor had the hepatic or common duct been ever found obstructed, like the cystic; no traces of inflammation discoverable, and, from the whole of what has appeared upon this subject, the morbid change may be considered as being connected with derangement of *function*.

[The inferences of M. Louis (*op. cit.*) from the same Gibraltar epidemic were,—that the liver is the only organ constantly, and more or less uniformly, altered; and that as such alteration is not found in persons dying of other diseases, it must necessarily be regarded as the anatomical character of yellow fever. The alteration of the liver consisted in a discoloration,—the organ being sometimes of the colour of fresh butter; at times, of a straw colour; at others, of that of coffee and milk; at others, of a yellowish green or mustard; and at others, of an orange or pistachio. In the yellow fever of Martinique, M. Catel observed these appearances in the whole of 150 cases examined in the hospital there; and in a single case that presented itself in the Pennsylvania Hospital, the appearances were found by Dr. Stewardson to be the same as those observed by M. Louis. (*Amer. Journ. of the Med. Sciences*, Jan. 1842.) On the other hand, M. Rufz, (*Medical Examiner*, vol. iii. p 54,) observed these in Martinique in only two of three cases. Dr. Ashbel Smith, in the yellow fever of Texas, (*An Account of the Yellow Fever which appeared in the City of Galveston, &c., in* 1839, Galveston, 1839,) saw the anæmic condition and light colour of the organ in three cases only out of seven; and in the yellow Fever of 1820, Professor Jackson (*American Journal of the Medical Sciences*) found the liver usually gorged with blood. Professor Physic states that he rarely found it diseased.]

The *gall-bladder*, usually containing bile, of a highly inspissated and sometimes dark tar-like appearance. *Stomach*, not unfrequently found to contain the *black vomit* strictly so called, and, though infinitely more rarely, may be smeared over with the dark adhesive and jelly-like substance spoken of under another head; containing sometimes an obvious proportion of blood mixed with other fluids; often the ingesta only, or mucus. Rugæ, the "*état mamelonné*," together with appearances adverted to under another head, as they are admitted to present themselves very frequently in dissections after diseases of any kind, or, indeed, where (as in the case of accidental death) no disease had existed, need not be particularly entered upon on this occasion. Those who have asserted that ulceration of the stomach takes place in any form of yellow fever, are quite unsupported in the statement by observations made with the greatest attention, and on a scale of sufficient extent: that mistakes have here, as on other occasions, often arisen from the facility with which the mucous membrane gives way on handling, there seems little reason to doubt. As to mere "*ramolissement*" of this membrane furnishing a proof of inflammation, this will not be now contended for, it is presumed; and it may be here stated that, on an examination in the case of a death by accident at Gibraltar in 1829, where the man had been in perfect health previously, the whole of this membrane, in the intestines as well as stomach, was, in the hands of experienced persons from Paris, found to be so soft that, with the utmost care, not more than two or three lines of it could be raised at any point, but for the most part not even that quantity. *The œsophagus* presents an appearance, in some of the cases where *black vomit* takes place, of this being thrown out from its surface as well as from that of the stomach, especially at its lower portion; an abrasion of its epithelion throughout its whole course has been sometimes observed, as in examinations after other diseases. The idea suggested itself at Gibraltar that this denuded state of the tube might give rise to the peculiar burning sensation noticed; but as the same sensation has been observed to occur frequently in cholera, a wider field is open on the point. *Duodenum*,—much of what has been observed regarding the stomach will apply here. *Small intestines*,—even in cases where no black vomit had been ejected before death, or where, on inspection after death, it had not been found either in the stomach or duodenum, the black jelly-like substance was sometimes found in the jejunum, but oftener in the ileum; and in some cases where it has been found both in the stomach and ileum, the *whole intervening jejunum* has not presented a trace of it. In the memoir by the writer of this article, from which imperfect extracts were some time ago printed in Paris, the remarkable fact was noticed that the ulceration so liable to take place during the progress of typhus, as well as other fevers *mali moris*, in that part of the ileum more especially occupied by the glands of Peyer, *are not found to take place in yellow fever*. The most trifling lesion has not been discovered in those parts of the intestine, on very careful examinations. *The colon*, its mucous surface sometimes covered with the adhesive black substance; in a few instances containing a quantity of a pale red fluid, approaching to blood in its character; is occasionally contracted at different parts. Whether we speak of the stomach or intestines, the mucous surface is usually found quite pale on removal of the particular substance described as being black and jelly-like. In the colon especially, but also in the small intestines, another substance has been occasionally found adhering in great quantity to the mucous substance; this has been compared by French writers to a mixture of linseed-meal and water; but it has been found of a lighter colour, so as to resemble the substance found sometimes adhering to the intestines of persons who have died of cholera spasmodica. Regarding red points or patches found not unfrequently in different parts of the intestinal canal, little need be added to what has been said, when speaking of the mucous membrane of the stomach, as to their not furnishing evidence of inflammation. If, as is the opinion of some of the most eminent pathologists of Europe, before inflammation of this surface be admitted it must be shown to be thickened as well as being red and so soft as not to admit of being torn off in portions of several lines in length, then may it, as we conceive, be with much certainty stated that the phenomena of yellow fever cannot, as has been supposed, be referred to *gastritis*, or *gastro-enteritis*. *The bladder*, in those cases where suppression of urine[*] took place, found contracted very remarkably, but without lesion. Mr. Linton, of the Naval Hospital, Jamaica, has noticed in one of his official reports, that he considered "the *pancreas* in some cases as being friable in texture;" but this has not been remarked by others who have paid the closest attention in their examinations; and regarding the alterations or lesions alleged from time to time to have been observed in other parts contained within the abdominal cavity, they do not seem to be verified in subsequent examinations conducted on a larger scale.

Within the cavity of the thorax no appreciable lesion of organs seems to be admitted in the more ordinary forms of yellow fever; the change of colour and friable texture of the heart, in the highly concentrated form, has been referred to. False polypi in the cavities of the heart have perhaps been more common in this form of yellow fever than is usually found to be the case after death from other diseases. In a limited number of cases, towards the close of the epidemic of 1828 at Gibraltar, the attention of the medical officers of the garrison was directed by some of the members of the French medical commission to those dark, well-defined circular patches in the lungs, having very much the colour and consistence of the spleen, which have been noticed in other diseases, and the appearance of which was perhaps merely adventitious on the occasion in question. In the examinations made in the year just mentioned, the blood was not observed of the particularly dark colour attributed to it in this disease by a few writers. The question, however, as to the changes in the chemical properties of this fluid remains open. *Contents of the cranium:* In the course of the last Gibraltar epidemic, as well as on other occasions in the West Indies and elsewhere, extensive observations, carefully conducted, have quite negatived any assertions made from time to time as to morbid changes in the substance of the brain; as an inordinate quantity of fluid in its cavities, or under its coverings; remarkable congestions; extravasation of blood; the effusion of lymph, &c.: even where profound coma had taken place in the Gibraltar cases, morbid states by which this might be explained were not discovered; and the deviations from perfectly natural states observed in any cases, were considered, by those who had most opportunities of making the examinations, as nothing more than the fortuitous appearances which present themselves in a proportion of instances, no matter from what disease death is produced, and which, as is now generally admitted, may arise from stasis, or the longer duration of the last agonies in particular instances: cadaveric changes, too, have, no doubt, given rise to mistakes, particularly as to great vascularity or congestion in the posterior and more dependent parts of the membranes of the brain, as it has regarding the most dependent folds of the intestines. *Contents of the vertebral column*, found to be equally free from lesion as those of the cranium. In examinations conducted on a small scale by a French medical commission sent to Barcelona during the epidemic of 1821, erroneous views had been hastily adopted as to the spine being the *fons et origo mali* in yellow fever; but those opinions were, wholly or in part, subsequently admitted to have been erroneous. Magendie having shown that a certain quantity of fluid within the theca belongs to a natural state of the parts, errors on the part of future observers are less likely to occur.

Before quitting the subject of morbid appearances, it may be stated that a very remarkable occurrence presented itself in a few instances during the last Gibraltar epidemic, — the infiltration of venous blood, in the most uniform manner possible, into the cellular tissue of the minutest fibres of muscles. The whole substance of the muscles, which appeared almost black, seemed one soft mass, which yielded to pressure between the fingers as readily as the spleen. The blood thrown out became grumous, so that incisions caused but little exudation from the parts; no putrid odour or appearance of sloughing. In one man this infiltration took place into the whole of the muscles of the right thigh, the abductors excepted, from their origin to their insertion; in another the parts involved were the gastrocnemii of the left leg and flexors of the right arm. This man had suffered a good deal of pain in those parts, and the process was very rapid. In a third case precisely half the diaphragm (right side) was found in this state; and the infiltration, bound down by all the foldings of the peritoneum, extended in a most singular manner in one continuous sheet, from the diaphragm, posteriorly, down the right side to the bottom of the pelvis, keeping with great precision a line corresponding to the axis of the vertebral column, and covering every organ, or part of intestine, &c., which lay on that side. The muscles, except in the portion of the diaphragm referred to, were healthy. In this case the disease had run a rapid course, and some of the symptoms were well marked, as yellowness of the eyes and skin, violent jactitation, delirium, singultus, and dark stools, *but no black vomit:* a remarkable tremulous motion of the hands, not common during the epidemic, also took place in this case, near the close of the attack. We were not in those cases able to discover the rupture of any considerable vein. Although Arejula notices in his work the occurrence of large and painful tumours during some of the epidemics of Spain, which, had examinations after death taken place, would probably have been found of the nature just referred to, nothing as to the occurrence, in the yellow fever of parts of Europe, of the precise morbid states here referred to appeared till the publication, at Paris, in one of the numbers for 1829 of the Bulletin of Sciences, of an abridgment of notes, made by the writer of this, of the autopsies at Gibraltar, in 1828. Up to so late a period as 1828, the identity of the yellow fever of Spain with that of the West Indies had been denied by Dr. Rocheaux, who was at Barcelona in the epidemic season of 1821; but the editors of the Bulletin consider all doubt now at an end, "*identité parfaite*" being established by the account of those infiltrations in the cellular tissue in some of the Gibraltar cases. In America and the West Indies those appearances had been particularly noticed by Dr. Chervin of Paris, so celebrated for his researches in yellow fever for many years; they are particularly noticed in a communication to the Academy of Medicine, in 1827, by Dr. Keraudren, from one of the French West India Islands.

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[*] In some cases, especially children, *retention* of urine has taken place in this disease and been mistaken for suppression; so that, on a post-mortem examination, the bladder has been found distended above the pubis: the occurrence of this at Gibraltar in 1828 led to the practice of careful examination of the region of the bladder.

Mortality.—As has been frequently observed regarding other diseases, the malignity of the cases, and consequently the mortality, is usually much greater in the first than in subsequent periods of yellow fever epidemics; the violence of the disease has, however, been known to receive, in some rare instances, a fresh impulse, as at New York in 1822.[*] In *Hurtado's Decadas* it is stated that, of the first 134 cases treated at Murcia in 1804, not more than three or four recovered. Dr. Rocheaux, one of the French physicians at Barcelona during the epidemic of 1821, states, in his book on yellow fever, printed in 1828, that in the early part of the epidemic the mortality was in the proportion of 19 out of 20; that towards the middle it became much less, and at the close was only two-thirds. (Vide p. 464.) In the early part of the Gibraltar epidemic of 1828, very few recoveries took place in the Civil Hospital; of the first thirty-five Jews received into the establishment, it is stated that all but one were swept away. On the same occasion, two corps in particular, as officially stated to the authorities by the late Dr. Hennen, then medical chief, were early attacked by the disease in a peculiarly malignant form, and suffered a loss of about one-half of the cases. On some occasions the form of the disease has been so mild that very few deaths have been recorded in proportion to the numbers attacked: even during the same epidemic, from a difference in the localities, or from other circumstances not admitting of easy explanation, there has been less mortality, in proportion, in one regiment,[†] class of persons, or family, without an essential difference in the mode of treatment, and solely arising from the disease having been milder. A full consideration of the subject must prove that the *expectante* system, or any system of "mild popular remedies," cannot be admitted (as has been attempted to be shown) to be followed by less mortality than what our French neighbours call "*les moyens perturbateurs.*" It does not appear that in their colonies, where trifling means only have been so often resorted to by the French, any good has followed. At Barcelona, in 1821, scarcely a patient survived in the wards given up to the distinguished members of the French commission. (O'Halloran on the yellow fever of Spain.) At the period in question, the mortality, under Spanish and French medical men, in the establishment called *Seminario*, was 1265, out of 1739 cases treated. Under the *mild*, or what has been called the French and Spanish treatment, the mortality at Malaga in 1803 was 11,486, out of a population of 36,054. In the epidemic of the preceding year at the same place, 6,684 deaths occurred out of 16,517 attacked. In an epidemic at Xeres a few years ago, one-third of the whole population was swept off, under circumstances when, in the bulk of the patients, a few domestic remedies only could have been employed. Many other similar instances might be cited in proof of our being warranted in employing potent means likely to induce a favourable change in the form of the disease on its first invasion. From the wide range which the symptoms take,—so wide that, but for the *black vomit* being *liable* to occur, as a connecting link in the various forms during the prevalence of an epidemic, we should, from the symptoms, as well as *post-mortem* appearances, often have reason to suppose that different remote causes were giving rise to different impressions,—it is obvious that in no disease is it more difficult to lay down rules of practice, and in none can the medical man's tact and attention be more needed.

[In the Gibraltar fever of 1828, according to a calculation made by the medical commission, from 600 cases, short histories of which had been taken, the mortality was in the proportion of one to six and a half. It varied, however, according to age and sex;—of children attacked, a seventh part only died; of women one in five and a half, and of men one in four and a-half. M. Louis observes (*Op. cit.* p. 261,) that the same symptoms had not the same value in prognosis at all periods of life; for instance, the black vomit, which in men was the most certain harbinger of death, took place in a great many children who recovered.]

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[*] About the middle of October "the disease became again as fatal, or indeed more so, than at its commencement; the proportion of deaths being to the proportion of sick as *three to four!*"—*Townsend, Yellow Fever of 1822 at New York, p.* 197.

[†] At Gibraltar, in the epidemic of 1813, the mortality was so much less in the Military Hospital under Mr. Brown, that medical gentlemen were induced to inquire into his practice, which they found did not differ from their own.

Nature of the Disease.—It has been attempted, on various occasions, to explain the phenomena of the disease by the inflammation of certain organs or parts; and by the majority of those who have adopted this view of the matter, the gastro-intestinal mucous membrane is the part to which the morbid action has been assigned.* As might have been anticipated, we find this doctrine supported by all the ingenuity of Broussais and his followers; but by nobody has it been more strenuously advocated than by M. Boisseau, in his "*Pyrétologie*" (fourth edition). Among the medical men out of Europe who have advocated this last opinion, the statements of Dr. Bone, of the British army, who has been resident for many years in the West Indies, are perhaps worthy of most attention; they are to be found among the many valuable manuscript documents in the archives of the Army Medical Department in London. What has been shown, however, under the head of *morbid appearances*, will probably establish, to the satisfaction of our readers, that there are sufficient grounds for believing that the primary morbid action is not the alleged inflammation of parts. The inhalation of a specific poison has, as on other occasions, been considered by some as directly productive of changes in the chemical properties of the blood sufficient to account for the derangement of various functions which occur in this disease; but, without denying the probability of this, there is as yet nothing before the public to establish the point satisfactorily. Dr. Guyon, who practised for some years at Martinique, has spoken of this "lésion" of the blood as probable; and Dr. de Fermon, of Paris, well known for his acumen in all matters relating to medical science, seems to favour this view of an alteration of the blood, "*primitivement*," in yellow fever. In the most concentrated and rapidly fatal form of the disease, there is evidence, as has been shown, in proof of congestion in the liver. By others, the nervous system is considered as primarily affected, and some observations lately made on this subject by Dr. Wilson, of the navy, in his very ingenious book on yellow fever, seem particularly worthy of notice; especially with respect to the different train of symptoms to be looked for—on the one hand by the *abstraction*, and, on the other, by the *obstruction* of the nervous power in different individuals. The uniform integrity of the cerebral functions in the first stages of this malady, as observed at Gibraltar in 1828, and as noticed on other occasions by many authors—the extremely frequent integrity of those functions to almost the last moment of existence, in its "congestive" or most intense and fearful form,—together with the remarkable manner in which (in the last mentioned form especially) the secretions are suspended,—induced the writer of this, when drawing up a review of the last Gibraltar epidemic (1828), to state his belief that the ganglionic system was involved *very prominently*, in the series of morbid actions. That this should in any case be the first link of the chain can never perhaps be satisfactorily demonstrated; but on many occasions it appears highly probable from the manner in which several fatal signs concur with the suppression of the secretions, as if some powerful agent had been directly applied to that system of nerves which so specially presides over the secreting organs. But to enlarge on points necessarily speculative would be unfitting an occasion like the present.

Cause of the Disease.—The more fully this subject is examined, the more evident it must appear that in the present state of our knowledge nothing satisfactory can be arrived at; for although, as will be shown when speaking of *contagion*, reasonable causes have been sometimes assigned for the appearance of the disease on board ship as well as in certain localities, it has been impossible to assign appreciable causes in many other instances. What can be stated in this respect with regard to Gibraltar, will apply to other places. By ample tables in our possession, it does not appear that either before the appearance of the epidemic of 1828 in that garrison, or during its progress, any atmospheric changes took place differing materially from other years in which epidemics did not occur. The average heat was not greater† than that of the preceding year. The quantity of rain which had fallen up to the appearance of the epidemic was within a fraction of that which fell in 1827. The influence of a prevalent easterly wind had been much dwelt upon in the explanations offered respecting the epidemic at that place in 1804; but in 1828 no unusual prevalence of that wind took place. In fairness, we think that, like many other places which may be mentioned where yellow fever is known from time to time to appear, it cannot be admitted that Gibraltar furnishes sources from which *malaria, in the usual sense of that word*, arises, sufficient to account for the appearance of a malignant fever; neither can we concede to authorities of great respectability, that either there or in various other places the solution of the question is to be found in a crowded population, the filth of the town, or the state of the sewers; though the last may have been an auxiliary. Compared with Gibraltar, places might be mentioned where, as we know, yellow fever does not appear, in which those circumstances obtain in a much greater degree. It may be urged against the salubrity of Gibraltar, that the habitations are for the most part deprived of free ventilation, being backed by a rock of from twelve to fourteen hundred feet high; and that the impinging of the sun's rays, for so many hours daily, on the sloping and inhabited part of the rock, should be admitted to a share in the consideration: but the great mystery is, that with these and other circumstances in operation every year, the disease should only prevail epidemically in particular years. Though a certain degree of heat seems so essential, it by no means appears that epidemics have usually occurred in years most remarkable for heat. If we consider soil and elevation, it must be admitted that here too no satisfactory conclusion can be drawn; for if we find evidence, especially in the West Indies and on the American continent, of the influence of a marshy soil, on several occasions, this does not hold good in other instances; and in those countries, as well as in Spain, many places might be mentioned where elevation, soil, &c. would seem to guaranty immunity, but where, nevertheless, the disease occasionally prevails to a devastating extent.

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* Tomassini, strangely enough, considers not only the gastro-intestinal mucous membrane as the seat of inflammation in yellow fever, but also the liver.

† Average at noon, in the autumnal quarter, … 76¼
" " in the last quarter, ……… 63¾

Notwithstanding what has been here said, we do not apprehend that, in the present day, epidemic or catastatic influences in determining the irruption of diseases will be denied, though not cognizable by our senses, or appreciable perhaps by chemical tests.

Influence of temperature, &c. — There is nothing connected with yellow fever which seems so invariable as the decline of the epidemic on the setting in of cool weather. At a temperature of about 50° Fahr., fresh cases soon cease to appear, and in Spain and North America the disappearance of the disease at a particular period is usually calculated upon with precision.

In some epidemics females have remained wonderfully exempt: this was the case during a terrific epidemic at Dominique and Martinique in 1891, as the writer of this witnessed; for while two battalions of the 68th regiment, composed of fine young men, suffered so much from the disease as not to be able latterly to furnish any men for duty, and had lost forty-six officers within six months, not a single woman was attacked; and it may be observed that, in those days, more females were allowed to embark with regiments from home than at present. Children were also exempt on the occasion in question. In some epidemics in Spain the disease has been observed to attack women in a milder form; while in others, as that of Xeres in 1811, they suffered in a particular manner. During the early part of the epidemic at Gibraltar in 1828, the women were attacked with great severity, but subsequently in a milder form. On that occasion, too, children under twelve months had well-marked symptoms.

Particular classes will sometimes suffer more than others; thus, according to a memoir by Mr. Hugh Frazer, lately surgeon to the Gibraltar Civil Hospital, of the first thirty-five Jews who presented themselves to him during the epidemic there of 1828, scarcely a single person recovered. Bakers and cooks have been said to suffer in a greater proportion than common; but perhaps the nature of their occupations permits fewer of these people, in proportion, from leaving a city or town when an epidemic prevails. Negroes are considered as being usually insusceptible of attacks; but even in them a susceptibility has been created, as on certain occasions in America, by a residence for some time in a different climate from that to which they had been long accustomed: indeed, without change of climate, they have, as instanced by Dr. O'Halloran in his report of the Jamaica epidemic of 1825–6, been attacked in considerable numbers, though not with equal severity as the white population. At Gibraltar in 1828, a negro, the servant of a hotel-keeper, had *two* attacks, one of which was particularly well marked. Circumstances connected with localities being equal, the upper classes of society seem, on all occasions, to suffer from attacks in a full proportion. Persons of regular habits do not seem less exempt from attacks during epidemics; but it may be admitted that their chance of recovery is greater than in the case of free livers. Those born or long resident in places where the disease is liable to prevail, will escape from attacks during the prevalence of some epidemics, while in others (as in that at Barbadoes in 1816, and Jamaica in 1825–6) the old inhabitants will suffer in proportion. A well-marked attack on one occasion gives a great degree of security from attacks during subsequent epidemics: this was stated, some fifty years ago, by Lining, reiterated by Sauvages, and known so well among Spanish medical men, that the late Dr. Arejula placarded the fact on the corners of the streets in Medina Sidonia in 1801, with the view of insuring better attendance to the sick: the claims, therefore, of some persons of late years to any *discovery* on this point, are utterly groundless, as are the statements which would go to the denial of the fact, regarding the occasional occurrence of two distinct attacks at remote periods; and, were this a place for minute details upon every point connected with yellow fever, a list could be furnished of the names and dates of several which took place at Gibraltar. Relapses are very common: at Gibraltar, in 1828, one hundred and two cases of relapse occurred among the military alone; and their names have been registered in the medical office of that place. The occupiers of upper floors have, in many instances, especially at the commencement of epidemics, been attacked in fewer numbers than those on ground floors; and in the West Indies and Gibraltar, families occupying low huts have frequently furnished the first cases. The manner in which the disease has sometimes been confined to a particular extremity of a building, or even to a particular side of a ship, is well illustrated by surgeon Callow, 84th regiment, at Fort Augusta, Jamaica, in his official report for 1827; and by surgeon Wilson, Royal Navy, in his work on yellow fever.

[The attention of the Gibraltar commission was directed to two points. *First.* Whether an individual, who had had yellow fever in Europe, was susceptible of a second attack in Europe. And *secondly.* Whether one who had had the disease in Europe could have it a second time in America, and conversely? Their inferences were, that second attacks are more rare in the case of yellow fever than of small-pox,—that a person once attacked, even in the slightest degree, is, with very rare exceptions, for ever exempt from future attacks; and that this is true, not only where the first attack and second exposure have taken place in Europe, but where the attack and exposure have been in different continents. It was remarked, that the preservative influence of a first attack is not destroyed after a considerable lapse of time, —24 years for example,—since the inhabitants of Gibraltar, who had passed through the yellow fever in 1804, were preserved from it in 1828 as effectually as those who had been attacked by it in 1815. (Louis, *op. cit.* p. 312.)]

Treatment. — It is painful to be obliged to admit that our advancement, within the last half century, towards any thing like a satisfactory treatment of this disease, in its formidable shape, has been sadly disproportionate to the degree of intellect brought to bear upon the subject within that time by professional men of different countries. Even with respect to those forms in which the symptoms, though formidable, are comparatively less intense, it seems very difficult to draw, from a review of what has been done by many, fixed rules for our guidance on certain points of practice. The discrepancy in the statements of respectable authorities regarding the efficacy of a particular line of practice can indeed be no otherwise explained than by the admission that in some epidemics very remarkable peculiarities occur. *Venesection* may be particularly referred to in illustration; for though it has over and over again, after trials in the hands of men who are not to be set down as injudicious, been decried in our West India colonies as well as America; and though it has been generally abandoned long since by the *experienced* practitioners of Spain, we find it, nevertheless, lauded on certain occasions, especially very lately at Trinidad, jointly with the warm bath and other means, by persons of unquestionable judgment. On our first acquaintance with this disease, nothing would seem more plainly indicated than this remedy, when the excitement runs high; but it has been too frequently found that after its employment, even but to a limited extent, the true character of the disease had been masked, and, as the Spanish practitioners express it, that the patient is speedily found to require all the strength which had been *taken away*. Frequently as we have witnessed blood taken from the arm in this disease, under a strong impression that a highly inflammatory action was going on, never has the blood, in a single instance, presented a buffy surface with a firm coagulum; it has on the contrary always formed a loose mass, yielding readily to the pressure of a finger, the serum separating very imperfectly or not at all. It may here be mentioned that our experience by no means bears out the assertion of some, as to the remarkably dark colour of the blood drawn from yellow fever patients. Without any intention to impugn the statements respecting the advantages derived from liberal venesection on particular occasions in the West Indies, it must be declared that the weight of evidence is against its general adoption in yellow fever, even where, *primâ facie*, it would seem to be indicated. The valuable naval medical records at Somerset-house being rendered accessible for reference by the liberality of Sir W. Burnett, some highly interesting observations on the point in question will be found in the reports from Mr. Linton, who has been long resident in the West Indies, and for some time in charge of the Naval Hospital at Jamaica. Quite in accordance with our ample experience of the disease, as it has appeared in the West Indies and Gibraltar, this gentleman describes the disease as "decidedly not inflammatory," though "inflammatory symptoms may concurrently or adventitiously take place:"—would adopt the expression "*inflammatio simulata,*" as expressive of "irritation or vascular sensibility:"—states that in the records, extending back for many years, the mortality was very great from the depleting system, which, from the *seeming* inflammatory nature of the disease, had been acted upon; and that the "*post-mortem* examinations which have occurred within the last twelve months [referring to a particular sickly season] presented no appearances which could be legitimately ascribed to this state [inflammation]." As in other fevers, circumstances will arise where the application of leeches to the temples, or of leeches and cupping-glasses to the epigastrium, may be strongly indicated; but the experience of others bears out the last-quoted gentleman in a remark that there is great risk of mischief from opening the temporal artery, collapse being very liable to be induced. Having mentioned cupping, it suggests itself (though perhaps not as a very promising speculation) that in the hope of affording some palliation of the incessant vomiting often so very distressing in yellow fever, we may give a trial to dry cupping on the epigastrium, as practised by ancient physicians in their endeavours to relieve the vomiting in malignant cholera. *Blisters*, with this object, are frequently applied at an early stage to the same part; but to Mr. Linton of the Royal Navy the profession is indebted for a suggestion as to their application in another manner with the same view. He states in a report from Jamaica, dated September, 1830, that having placed a blister the whole length of the spine in a certain number of cases, the irritability of the stomach was relieved in all except one. Their application to the head is sometimes found beneficial in protracted cases accompanied by cerebral affection. The *warm bath*, where we have not morbid heat of the surface with high vascular action, holds its place as a useful auxiliary in the early stage; and where these symptoms predominate, the *tepid bath*, occasionally repeated, is employed by many; or, by some, the *cold bath*, or sponging with cold water, or with vinegar and water. Assiduous friction of the whole surface, after the bath in any form, has been considered beneficial. The promised advantages from Dr. Jackson's suggestion of a cold bath with frictions, immediately after a warm bath, have not been realized. The application of cold by means of wet cloths to the forehead has been found useful in relieving the severe frontal pains liable to occur in persons in the full vigour of life.

Regarding *internal remedies*, they cannot in truth be spoken of in this as in almost all other diseases, for in the generality of cases the irritability of the stomach is so great that hour after hour, at the period when medicines might be hoped to make some impression on the disease, drinks of the mildest kind and medicines of every description, even in the smallest quantity, are instantly rejected; and, driven to total despair of anything being retained, we are often obliged to leave nature to her own resources, in expectation of an interval of repose. In a disease of this kind it seems quite impossible to explain how, up to the time of his death, large doses of *the bark* should have merited the special favour of Dr. Lafuente, one of the principal physicians connected with the epidemics of Andalusia during some of the first years of the present century. Where remissions take place, as noticed by several authors, as well during convalescence, the advantages from the exhibition of *quinine* seem to be generally admitted; but the doses must be regulated with caution, for given in large quantities, it has not only produced great irritability of the stomach, but much mischief in the head.

[Within the last few years, much attention has been paid in Louisiana to the effect of large doses of sulphate of quinia in this disease,—not given during a period of remission, but in the very incipiency, whilst the morbid action is forming, and before any local lesions have occurred. It was prescribed in one very large dose of from 20 to 50 or 80 grains, and is said to have acted like a charm. When taken under such circumstances, its effects are said to be, a very slight increase of the febrile symptoms; the pulse is perhaps quickened; the respiration more hurried, and the usual signs of excitement are present. This condition is, however, but transient, and it is promptly followed by corresponding depression. All the more violent symptoms subside; the temperature of the surface is lowered; pain is diminished; the pulse is gentle and subdued, and the skin covered with a healthy moisture:—in short, the chain of morbid associations is broken, sleep is induced, from which the patient awakes refreshed, and substantially better; and within 24 or 36 hours, he is considered to be in a state of convalescence. (*Medical Examiner*, Oct. 19 and Oct. 26, 1839.)]

Among a very limited number of practitioners have *emetics* been at any time in favour. Arejula, the great authority on the epidemics of Andalusia, informs us that in pregnant women he found their exhibition prevent abortion and its usual consequence, death; this, to the extent of a few cases, seemed to have been corroborated in the practice of a Spanish medical man at Gibraltar, in the epidemic there of 1828. In a report drawn up by a commission of Seville physicians, relative to an epidemic which prevailed in the quarter of Santa Cruz, in that city, in 1819, it is stated that much reliance had been placed on the exhibition of antimonial emetics in the early stage. (Decadas de Hurtado, vol. iii. p. 120.) In No. 16 of the Gazette of Health, there is a paper by Dr. Hacket, surgeon to the forces, in which, referring to a late period of sickness at Trinidad, he states that his "practice commenced in almost every case by an emetic of sulphate of zinc;" and it would seem that in the employment of this, in addition to his other means, he found sufficient reason for being satisfied as to its utility. This may be the place to refer to the exhibition of the nitrate of silver, given by Dr. O'Halloran, surgeon to the 77th regiment, at Jamaica, in 1827, in doses of from four to six grains, so as to act as an emetic; and from which this gentleman at one time conceived that he had received considerable advantages in his practice; but it is proper to state that, however further trials of this particular form of medicine may be warranted, he has not, in a conversation which we have had lately with him on the subject, expressed himself very confidently as to its efficacy. In regard to *purgative medicines*, there seems, among the mass of experienced practitioners, an admission as to the propriety of their employment in those forms where the excitement runs high, although the practice is not without opponents from the modern school, which refers the train of symptoms in this as in so many other diseases to inflammation of the gastro-intestinal mucous membrane. It is not an easy matter to conceive how, in this disease, bulky doses of drastic purgatives, as jalap, &c. could have merited the estimation in which they were at one time held, their immediate rejection from the stomach being always so exceedingly probable. This unquiet state of the stomach has led to a very general practice, especially (but by no means exclusively) among British medical men, of administering, in as small a form as possible, doses of calomel with the view of clearing out the bowels as a first step; and whether in the form of small pills, or the powder in half a tea-spoonful or so of gruel cautiously swallowed, there is always a greater chance of its being retained than perhaps any other form of purgative. It would seem, however, that the proposed object may with more certainty be obtained by the application of the croton oil to the tongue, as particularly recommended in the number for August, 1825, of the Medical and Physical Journal, by Mr. Tegart, formerly chief of the medical department of our West India islands. A drop or two on the tongue has not only excited the immediate action of the bowels, without increasing the irritability of the stomach, but has also been observed to favour the secretion from the kidneys, a point perhaps of no small importance. In the paper by Mr. Hacket who has been referred to, written this year (1832) no small share of success in the treatment of yellow fever at Trinidad is attributed to the croton oil, which it would appear this gentleman gave in large doses, as well as exhibiting it in the form of enemata; for after mentioning the emetics of sulphate of zinc, bleeding in the warm bath, the shower bath, and enemata of salts and castor oil, where there was much excitement, he states that "croton oil was invariably given to the extent of three or four drops. I have known this repeated thrice through the night; and it is most worthy of remark, the more irritable and distressed the stomach,—though, *primâ facie*, to those unacquainted with the great febrifuge virtues and extraordinary powers of croton oil in restoring the peristaltic motion of the intestines, which seems in other diseases to be inverted altogether, this irritability, hitherto our bane, (I may almost say the very leading feature and peculiarity of tropical fevers,) would be to them a cogent reason for not administering the oil,—yet in almost all such cases it was found invariably to be triumphant, so that in the morning we generally found our patient thus treated with a perfect or nearly perfect remission." He says, a little further on, "the power of croton oil in allaying gastric irritability and general nervous excitement, as well as restoring the circulation to the surface, and thus relieving the congestive state of the internal and deep-seated central vessels, is really extraordinary; and though it may seem for the moment, when first given, to increase that irritability, yet after a little time I have hardly ever seen it fail in producing the desired end." Much as we are taught by experience not to be too confident in our expectations of the efficacy of medicines, from the advantages which may seem to result from their employment in particular instances, there is enough here, from a gentleman who has had ample field of observation, to draw special attention. According to an official report referring to the events of the epidemic of 1821 at Barbadoes, Dr. Bone, deputy-inspector-general of hospitals, who had a very important charge at the time, relied chiefly on the exhibition of opening medicines of the saline class; during the first twenty-four hours, for instance, four ounces of Rochelle salts, with or without two grains of tartarised antimony, given in small doses. But if what he considers as obstruction of the gall-duct took place (shown by the absence of bile from the dejections), he continued this solution, with perhaps small doses of the extr. cathart. for three or four days, or until bile appeared. He varied his saline medicines to Seidlitz powders, Cheltenham salts, soda tartar., or potass. tartar.; or he gave the cassia fistula; and this, with the occasional use of the warm bath, seems to have been his widest range of practice. That on the occasion in question Dr. Bone should have displayed sound judgment cannot be doubted, from his extensive experience for many years in the West Indies, and from the remarkable degree of tact which he has displayed on many practical points connected with yellow fever. How far any of the alleged advantages derived from this practice may be attributable to the views lately promulgated by Dr. Stevens, it is impossible to say, as the question of the advantages of the exhibition of neutral salts in yellow fever, on the principle of their immediate action on the blood, is involved in controversy. But whether in reference to the exhibition of small doses of neutral salts as here spoken of, or to the popular remedies long in use in Spain, of large doses of the supertart. potassæ, or of olive oil, or of castor oil, the difficulty always presents itself as to those means being generally applicable in a disease where the excessive irritability of the stomach forms so prominent a character. *Enemata* are very generally had recourse to as useful auxiliaries; one consisting of sea-water only was preferred by the late Arejula of Spain. In the West Indies and other places a proportion of the ol. terebinth. has been sometimes used with the other materials. At Gibraltar, in 1828, the employment of enemata of every kind was not unfrequently found impracticable from distressing excoriations which took place about the anus.

Mercury. — On a review of the different modes of practice adopted in this proteiform disease, within the last forty-two years, by practitioners in the British West India islands, the United States, and Gibraltar, this remedy seems to have best maintained its ground; for though it be quite true that it has from time to time fallen into discredit from persons having, in the course of an epidemic, frequently found, that, like all other human means, it made no impression on the most aggravated forms of the disease, it nevertheless has stronger testimony in its favour than any other practice which can be named. The late venerable Chisholm said, after a consideration of the subject during thirty years, "Are we then, from any vain or unfounded apprehension, from reasoning drawn from false premises, or from uninformed or prejudiced minds, to yield up the result of our own frequently reiterated experience? — to relinquish the best aid [*i. e.* mercury] which we can bring to the support and relief of our fellow creatures suffering under so direful a malady? — Forbid it humanity! — forbid it heaven!"

Since the history of the American epidemics of 1793 and 1794, by Rush, numberless have been the publications in which the practice, either by inunction or otherwise, has been recommended, and the medical archives of our army and navy contain very strong evidence of the great advantage to be expected from the remedy in one shape or other (though not to the exclusion of other means) in those cases where a hope from the employment of any remedies can be entertained. Among the latest authorities in its favour is Mr. Linton, of the Naval Hospital, Jamaica, the gentleman before quoted as having had long experience in the West Indies. He states in his official report of December, 1829, that in his practice, after purging, the bath, and blisters, he gave calomel every two hours, in doses of from five to ten grains, and that, where the symptoms made rapid strides, he commenced mercurial frictions at an early period. He states in a previous report that, where he had been tempted, after the first calm from various remedies, not to push the mercury, he "had frequent reason to regret this *misplaced confidence.*" He says, "In every instance, as soon as the mouth became affected by the mercury, so that ptyalism was unequivocally established, the patient might confidently be pronounced convalescent." He remarks, with great judgment, and in doing so he is perfectly borne out by the experience of others, that, "there is, however, a condidition of the gums, which are only to a certain degree affected by mercury, which is often confounded with ptyalism, and which has frequently induced some medical writers, unacquainted with or prejudiced against the use of mercury, to affirm that several patients die in a state of ptyalism. A strong mercurial halitus may be perceived; the gums are swelled, spongy, and livid, and a clammy, thick secretion of mucus, *not saliva,* takes place; but under these critical circumstances farther progress of ptyalism is arrested." Under these circumstances, and the symptoms not yielding, Mr. Linton recommends that the internal use of the remedy should be suspended; that generous nourishment, warm baths, and stimulants should be had recourse to, and frictions then continued in the hope of obtaining the desired end. In one of his reports he alludes to trials of the medicine in a particular form: "in three cases which recovered under similar circumstances, I have latterly employed a solution of oxymuriate of mercury with decided good effect; but when the stomach is very irritable, this form of medicine is inadmissible." Another gentleman of long experience in the West Indies, (Dr. John Arthur,) states in an official report from Barbadoes, of the 17th of March, 1821, "I believe far the most recoveries have been after the use of this medicine in one shape or other." It is stated in a report of the same year by staff-surgeon Hughes of Berbice, that calomel was given with "*great advantage*, and one satisfactory conclusion to be deduced from its operation, when it affects the mouth, was that of the patients being on the side of safety." In a report from surgeon Callow of the 84th regiment, relative to the Jamaica epidemic of 1827, he states that he "relied considerably upon the specific action of mercury for ultimate cure;" that he employed the blue-pill "certainly with advantage," and inunction as an invariable adjuvant. It has been stated by Dr. Francis, when referring to the treatment adopted in the epidemic of 1822 at New-York, that "mercury was considered by some physicians as conspicuous among the curative means." The history of the Gibraltar epidemics furnishes the names of many experienced men who have seen good reasons for relying much on the use of mercury in this disease; among these, Mr. Amiel, now surgeon to the 12th regiment, should, perhaps, stand first. This gentleman having witnessed epidemics in that garrison at three different periods, and closely observed the effects of treatment the most varied, considered mercury, up to the last case in 1828, as his "*sheet-anchor.*"

It is scarcely possible to name a British author on yellow fever whose views do not accord more or less with those expressed in the extracts here given. Mr. Wilson of the Royal Navy, the author of a work of great merit in many respects, published in 1827, when referring to the treatment even of those aggravated forms "where the nervous torpor and vascular atony are great, and where re-action is tardy, irregular, and imperfect; where the patient, without complaint of pain, lies prostrate, letting the head fall from the pillow, or pushing the pillow away, the countenance being ghastly, pale, or livid in colour, and fatuous in expression, the iris scarcely influenced by light," —informs us that "calomel ought to be administered in most cases from the beginning; it should not be delayed beyond the operation of the purgative medicine. The quantity of this most valuable remedy and its manner of combination with others, must of course be varied according to circumstances; but the dose must on the whole be large and often repeated. If the character of the disease be not changed at an early period, its end will generally be in death." He adds, "with the other remedies recommended, I have given, and would give, ten, fifteen, or twenty grains of calomel twice or thrice daily, with a grain or a grain and a half of opium to each dose, according to the state of the digestive organs." The other means to which he here alludes are warm baths of high temperature, ("above that which a person in health could bear,") and continued for some time, and assiduous friction after their employment; warm purgatives, combined with aromatics; warm drinks; warm stimulating injections; occasionally a little brandy, oil of terebinth in small doses; blisters over the epigastrium, between the shoulders, and to the head. He says that he was not deterred from this practice, in the forms alluded to, by the nausea and vomiting so characteristic of this fever. Like what occurs sometimes in the stage of re-action in cholera, he found it useful to abstract blood cautiously in the period of re-action following the low state of the animal energies here referred to. The *rationale* of Mr. Wilson's practice is extremely ingenious and well worthy of attention. He admits, as all must, "that in many cases the resources of our art have little influence on the disease, and that in its worst forms it is utterly beyond control." Indeed, it is not permitted us to be too sanguine as to the efficacy of any remedy in even a seemingly mild case of this "*perfidious*" disease; and the specific action of mercury, even after baths and aperients, will often fail to take place, the torpor of the absorbents being quite insurmountable; but as in an infinity of cases we can have no right to *assume* that this is the case, it must rest with the judgment of practitioners to decide how far they may be warranted in withholding a remedy standing so recommended as this does from various quarters.* Of one thing we have ourselves been convinced by ample experience, that though patients may often do well under other treatment, the medical attendant will be *infinitely less likely* to be taken by surprise, when ptyalism once sets in, by the sudden invasion of those symptoms which, within a couple of hours perhaps, are known to cut off a patient who seems to be in a state of convalescence, or nearly so. An objection is often made that, in the employment of these means, "*we lose time;*" and a very excellent objection it must be considered to be when it can be shewn that in the average of epidemics (for it is quite a delusion to speak of what takes place on particular occasions) other plans are found more useful.

Previous to dismissing the subject of the exhibition of mercury in yellow fever, it may be well to quote an observation from a gentleman in the West Indies, which goes to meet another objection sometimes made: "calomel does not, that I can perceive, produce any better effect in doses of twenty grains than in those of five; but even in very large doses I have *never* known it to cause hypercatharsis or any other bad symptom."†

The foregoing extracts are selected from a great mass to the same effect, as they complete the evidence that, up to the latest epidemics, mercury has been considered as holding a prominent place among the remedial means from which most hopes are entertained in yellow fever.

In the cases of profuse hemorrhage which frequently occur, the stomach is usually more retentive, and a bitter infusion, with a proportion of sulphuric acid, is found beneficial. The bleeding from the mouth is so excessive sometimes as to excite great apprehensions, but a strong solution of arg. nitr., applied very freely over the gums or other parts from whence blood is chiefly observed to flow, will often check it. In this stage of the disease every thing may be expected if circumstances admit of incessant good nursing, with the frequent supply, in small quantities, of nourishing articles of diet, as sago, arrow-root, broths, panado, &c., and wine or porter. This may be the place to refer to the hemorrhage from leech-wounds, formerly stated as likely to occur, and which it is extremely difficult to suppress when in soft parts, as the epigastrium; here minute bits of lint, dipped in the tinct. ferri mur., and pressed on each bleeding point by means of a probe, will be found more effectual than even the application of caustic in substance.

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* The remedy was adopted by Palloni, in the yellow-fever epidemic of 1804, at Leghorn. Among the Spanish practitioners who have adopted it are Dr. Flores Moreno, of Cadiz, Dr. Ardevol, of Gibraltar, and Dr. Bobadilla, also of the latter place, who had experience in epidemics of Andalusia during thirty years, and who was so confident of the remedy (chiefly in the form of inunction) that, on the invasion of the epidemic of 1828, he memorialized the governor of Gibraltar to be suffered to treat some of the military exclusively on his plan. The exhibition of mercury of late years by some of the best practical men in Great Britain and Ireland, not only in fevers *mali moris*, but in diseases purely inflammatory, including arachnitis, will probably tend to dissipate the prejudices of the French against the remedy. They have, indeed, already, by the admission of Messrs. Louis and Trousseau at Gibraltar, gained advantages from the adoption of mercurial frictions at Paris in puerperal peritonitis, a case of which seldom recovered under former practice there. Perhaps, too, as, according to the same gentlemen, two of every three cases of typhus die at the Paris hospitals, advantages might be looked forward to there by the adoption of the more energetic system of those British practitioners who find the exhibition of mercury diminish the mortality in this last disease.

† Surgeon Macdermot, 4th regiment. Official report to the Army Medical Board, December 20, 1821.

The occasional employment of other remedies, as saline draughts, sudorifics, opiates, ether, various cordials and aromatics, call for no particular remark. Where the remarkable "burning sensation" take places, extending sometimes as high as the pharynx, from about the cardiac orifice of the stomach, calcined magnesia and prepared chalk have each afforded occasional relief; but these cases must be considered as utterly hopeless. When in the advanced stages great exhaustion has been produced by the incessant vomiting and want of sleep, a moderate dose of opium and capsicum, in minutely-divided pills, has sometimes produced a better effect than other medicines.

The most grateful *drinks* are spruce or ginger-beer, or a mixture of the white of egg, sugar, water, and some aromatic. As no small consideration in the management of patients, the *temperature of the hospitals or apartments* demands great attention. From what they have seen useful in other fevers, those unacquainted with the peculiarities of this disease are very apt to err on the side of over-ventilation, whereby, in some of its forms and stages, the vital energies are liable to be lowered perhaps to an irretrievable degree in an inconceivably short space of time; hence *tents*, or slightly constructed huts, or temporary buildings are always objectionable. During the epidemic of 1828 at Gibraltar, a visit was made to one of the hospitals by Dr. Broadfoot, Mr. Amiel, and the writer of this article, when it was observed that in two of the wards an extraordinary proportion of the patients were doing well, and that in almost all these the specific action of mercury on the salivary glands had taken place. On inquiry it was established that, from an accidental circumstance, these wards were what might be called, *very badly ventilated;* and the circumstances altogether struck Mr. Amiel so forcibly that he instantly returned to his own hospital (12th regiment) and altered the plan of ventilation which had been previously adopted. This may at least be sufficient to draw attention to the point.

[In the epidemic of Gibraltar, of 1828, to which allusion has been so often made, the practice adopted by the medical staff of the British army bore no resemblance to that of the private practitioners of Gibraltar. The mortality under the plan pursued by the former was one in four and a half. The Spanish physicians employed bleeding very moderately, and only at the commencement of the disease; opened the bowels by gentle laxatives, or in the advanced stages by enemata, and gave mercury only in a few very severe cases. The mortality of this plan was one in six, a proportion which led the population of Gibraltar to consider the Spanish physicians to be much more successful than the British. It is affirmed, however, by M. Louis (*op. cit.*) that the difference was more apparent than real. All the patients treated by the military surgeons were, with few exceptions, robust and in the vigour of life. The male patients in the city, on the other hand, were, as a class, less robust than the soldiers, and a large portion of the civic patients was composed of women and children. It was found that strength and vigour of constitution appeared to be unfavourable to recovery, the ratio of mortality among children, as before observed, being one in seven, that of females one in five and a half, and that of males one in four and a half. Still, as elsewhere remarked, (*Practice of Medicine*, 2d edit. ii. 467,) the management of the Spanish physicians would appear to have been judicious, and equally favourable with the more heroic practice of the British army practitioners.]

Contagion.—Those who have in the least entered into the subject of yellow fever must be aware of the total impossibility of giving, here, even a slight sketch of all that has been brought forward from time to time on this part of our subject. The discussions regarding a great mass of details, up to a certain period, may be said to be condensed in the works of Blane, Fellows, and Pym, on the side of contagion; and of Bancroft, Jackson, Maclean, and Burnett on the opposite side. The elaborate works of Dr. Bancroft especially ("*Essay on Yellow Fever,*" "*Sequel to an Essay on Yellow Fever,*") embraced whatever could at the time be deemed the most essential points for consideration. From his analysis of the events of 1793 in the West Indies, as well as from statements furnished by other writers and the details given in the first part of this essay, it must be evident that Dr. Chisholm could not have been acquainted with the history of the disease when he stated that it made its first appearance in those islands in the year just mentioned. Dr. Bancroft's arguments against the importation of the disease in that year by the ship Hankey are greatly strengthened by the facts brought forward in a pamphlet on yellow fever by Dr. Veitch, of the Royal Navy.

It is usual to refer to Père Labat's statement of the alleged importation of the disease into Martinique, in 1682, by the ship Oriflamme, from Siam; to which it is objected that he has merely given vague reports of circumstances which occurred several years before his arrival in that island; and that if, as he states, the disease had been contracted at Brazil, where the ship touched, it was palpably erroneous to say that it had been imported from Siam. In the second volume, page 119, of Dr. Chisholm's work on the fevers of the West Indies, he gives an account, also, of an importation of the yellow fever into the island of Martinique while in our possession in 1796, which is very circumstantially proved to be erroneous in a paper to be found in the eighth volume of the Medico-Chirurgical Transactions, by Dr. Fergusson, inspector-general of hospitals, who happened to have served at the time with the troops on board the ship alleged to have imported the disease. There can be no doubt that among those who supported the views of Dr. Chisholm on contagion, respectable names are to be found; but even so soon after the periods to which he refers as 1801, when it fell to our lot to witness devastating epidemics in Martinique and Dominique, our experienced medical chief, Dr. Theodore Gordon, did not think it expedient to suggest any measures applicable to contagious diseases, nor did an apprehension upon the subject of contagion ever escape the lips of any of our seniors with whom we served. As regarded the men and officers on this occasion, an individual coming in contact with the disease for the first time could hardly, perhaps, form an opinion worthy of much attention; but a most remarkable circumstance was the *total* exemption of women and children under a certain age, as already noticed in the historical part of this essay, although no steps were taken in the way of precautionary measures.

In examining the official documents to be found in the office of the Army Medical Board in London, the following passage, contained in the report of inspector-general Tegart, dated 10th of March, 1823, is particularly striking: "In the various annual reports of the medical officers in this command, I have not seen one favouring or supporting the theory of contagion: they are all on the other side." This seems the more remarkable, as isolation of yellow fever cases, to a greater or less extent, was a measure approved of a short time before by Mr. Inspector Green, one of those gentlemen who had previously served in the West Indies about the time of Dr. Chisholm. Mr. Tegert, referring in his report to certain cases which occurred at Antigua in 1801, says, "The result is that this was decidedly yellow fever, and that the disease ceased on removal from the place, and was confined solely to those persons who occupied the room. Here is cause and effect." It must be admitted that, among the advocates of the contagion of yellow fever, very few are to be found in the West Indies in the present day. Dr. John Arthur, however, in an official report from Barbadoes, of the 17th of March, 1821, furnishes a mass of details, the result of his own observation, favouring that side of the question; and although most of his details on this point may be considered by some as only *simulative* of contagion, (the great error of former observers,) as they relate to individuals exposed equally or nearly so to other general causes prevalent at the period, the document is one which deserves on every account to be referred to, and especially should a parliamentary investigation on the subject of the contagion of yellow fever be again instituted in this country. Among the few who have of late years advocated the doctrine of contagion in the disease as it prevails in the West Indies, surgeon Callow of the 84th regiment is to be mentioned. In an official report, detailing the events connected with the epidemic of 1827, in his corps, at Fort Augusta, Jamaica, he states that, after a certain time, "strong evidence of the disease propagating itself began to appear." His chief reasons for coming to this conclusion seem to be that the attendants about the sick of every denomination suffered remarkably, and that the surgical patients were also attacked. In the report itself, however, unbiassed persons will discover the following reasons for hesitating before they draw similar conclusions:—1st, he states, that previous to the breaking out of the epidemic, he made an official report on the defects of the building occupied as an hospital, and situated close to the *lagune*, whence disagreeable odours arose: 2dly, that, during the epidemic, the winds in the night "had generally blown from N. W. very strong for some hours, a very unusual circumstance," the more prevalent winds from E., S., or S. W., preserving, as he states, the low sandy point on which Fort Augusta is built, from more frequent sources of sickness. 3dly. He describes the barracks as being in three ranges or divisions, and that, up to a certain day, every case which had occurred had been *at the extremity of each range of barrack*, "*and in no other*;" a very remarkable fact, certainly. 4thly. It appears that, after his regiment removed from Fort Augusta to a camp-ground near Stony-Hill, it became healthy, any fresh cases being, as he admits, traced to their origin in the Fort: some of the men confessed, indeed, that they had been ill previous to the move Dr. Weir, physician to the forces, in commenting on these events, in an official report dated Kingston, February 13, 1828, remarks that "there are some circumstances connected with the history of the lately prevailing epidemic, which, viewed in the abstract, might seem to favour the theory that this disease is endowed with a self-discriminating property; but, on the other hand, such would appear to be far out-balanced by many powerful facts: of these no little weight is due to the simple and well-authenticated truth, that a change of *locale* invariably and almost instantaneously arrests the destroyer in its progress, and that too without any bad consequences, as is well instanced in the above, and in the removal of the 33d and 22d detachments to Port Royal, where the royal artillery occupied the very same barrack, without suffering in the slightest degree." We have, in the circumstances just referred to respecting the 84th regiment, several points within a small compass, which should never be lost sight of in the consideration of such questions. The exemption of hospital attendants, in the following instance, will by many be probably ascribed to the circumstance of *the building occupied as an hospital having been in a more healthy situation than that of the 84th regiment, at Fort Augusta*:—"I have now, however, the heart-felt satisfaction of stating that, from the 20th of June, 1821, to the 20th of February, 1822, which includes the whole period of the sickly season, not one medical officer, white servant, or person employed in any capacity in the Naval Hospital* establishment, had been attacked with yellow fever, or any species of fever."†

Dr. Bone has resided in the West Indies for many years, and has from time to time drawn up elaborate reports upon yellow fever, frequently referred to by the members of the department to which he belongs; it may, therefore, be stated, for the benefit of those in search of information on this subject, that he says, in the same report, "the first important result which I have proved in the Naval Hospital is, that the *yellow fever*, as it is called, cannot by any possibility be communicated from one person to another." He states that thirty-five white servants had been employed, and concludes by observing, "So few in the West Indies believe the doctrine [contagion] that they may very safely be permitted to enjoy their own opinions: they cannot do much harm."

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* A splendid establishment, appropriated for some years past to the accommodation of the sick of the army.

† Official report from Dr. Bone, deputy-inspector-general of hospitals, Barbadoes.

We cannot pass over the official statements of Mr. Hartle, deputy inspector-general of hospitals, who has served in the West Indies through the various grades of the medical department of our army, during a period of more than thirty consecutive years. His report for 1822 contains particulars of a most interesting kind relative to the introduction (without subsequent diffusion of the disease) of many cases of the yellow fever into the island of Antigua: in one place he remarks, "It is a pleasing reflection, and a source of great gratification to me, that, notwithstanding one hundred and seven cases of yellow fever, as distressing and malignant as any I have before witnessed, have been by three vessels imported into this island since September, 1821, we have not a single instance of any individual but those directly exposed to the local causes [ships] having been attacked." He states that the sick received on shore from one of those ships (Dasher transport) were attended by Europeans. Mr. Hartle's account of the yellow fever on board the Pyramus frigate, which arrived in Kingston Harbour from Barbadoes, with many of her crew affected with the disease, on the 3d of January 1822, is highly important. The following are the principal facts recorded by this gentleman. Neither the officers nor men had been exposed to solar influence or other exciting causes. One of the principal reasons assigned for the breaking out of the disease was that this ship had been "injected with coal-tar, which, with bilge-water, caused remarkable effluvia." The only ships on the station injected with coal-tar, were the above, the Esk sloop of war, and Dasher transport, "all of which suffered, the former and latter especially, with a similar type of disease, yellow fever, in its most malignant form." He states that the crew of the Pyramus were landed and the ship dismantled. When the limber-boards were removed, the effluvium from the hold surpassed every thing which he had "ever before experienced." A boatswain looking into the hold from the lower deck, while an inspection by proper officers was going on, fainted, and passed afterwards through a formidable attack of the disease. Mr. Hartle himself, who was one of the officers appointed to examine into the state of the ship, escaped with slight indisposition. This gentleman states, respecting the others, that "every individual present at the opening of the holds and limber-boards was attacked by the prevailing disease." Although the frigate had been only six months from England, and was believed to have been a short time out of dock, four large mud-boats of filth were removed from her at Antigua, which was nine inches in depth in the hold. The negroes employed in removing this mass were obliged to go on deck occasionally, so insufferable was the stench, and three of them had the characteristic disease. The after-magazine, immediately under the gun-room, was found in the worst state, and this accounted, in the opinion of Mr. Hartle, for every officer's servant and servant of the gun-room mess having suffered. Objections having been made to the removal of the crew beyond the dock-yard, after their landing on the 15th, several cases occurred up to the 30th, in consequence, as was discovered, of the men having gone on board clandestinely; the crew were therefore encamped at some distance from the dock-yard, while a cleansing and thorough purification took place; and on returning on board, their general state of health continued good.

Within the last few years much valuable information upon yellow fever has been from time to time furnished by Dr. W. Fergusson, inspector-general of hospitals; and it is to be regretted that want of space precludes the possibility of extracting, as freely as would be desirable, from documents furnished by a gentleman of such great experience, tact, and candour. His paper in the eighth volume of the Medico-Chirurgical Transactions is particularly interesting, and refers chiefly to transactions which occurred while he was principal medical officer in the West Indies in 1816, &c. Dr. Fergusson is quite adverse to the doctrine of contagion in yellow fever; and it will be admitted, as we conceive, that the facts which he has adduced in the paper just mentioned, are calculated of themselves to make a powerful impression. He shows, that, without restraint as to intercourse, situation alone has given great comparative exemption from yellow fever to raw soldiers from England over civilians; that the disease "is confined, in all the islands, to the sea-coast;" and that, "at Barbadoes, our hospitals, of late years, have been in a regular course of importation of the yellow fever from the navy; but not even inoculation has been able to produce the disease upon any member of the hospital corps, by whom I may truly say that the sick have been received with open arms; for the anti-social doctrines of ideal contagions are not preached among us here, to the prejudice of duty and humanity." Speaking of the general impression of St. Domingo, on the subject of contagion, during our occupation of that island, he says, "I never even heard the idea started, nor do I recollect a single precaution, advice, or observation, that acknowledged the existence of contagion, ever being directed to the medical staff from any quarter. I appeal to the writings of Dr. M'Lean, the living evidence of Mr. Weir, Dr. Jackson, Drs. Theodore Gordon, Borland, Inspector Warren, and all the medical officers who served there, to bear me out in this assertion. I appeal to the evidence of every medical officer now serving in the West Indies, that has ever had experience of the disease (for there may very probably be found contagionists among those who never saw it) to say whether in their lives they ever met with a case of yellow fever that could with greater feasibility be traced to personal communication with a subject labouring under the disease, than to the ordinary natural causes from which it has been proved to originate." Dr. Fergusson's remarks go to corroborate the curious fact occasionally to be found in authors as to "different parts of the same town being differently affected; and so limited often is their influence, that one story of a house,[*] or one section of a ship, will be strongly affected by it, while other parts of the same tenements remain healthy." In the paper from which these extracts are taken, will be found details of the highest value relative to the disease in question, as it prevailed among the crew of the Regalia transport, employed in carrying black recruits from the coast of Guinea to the West Indies in 1816; and from which it appears that the crew were in good health previous to taking in many tons of green wood at Sierra Leone; that great sickness (chiefly dysentery) prevailed among the blacks during the voyage; and that several deaths took place; but the yellow fever was altogether confined to the crew; and, in the words of Dr. Fergusson, "the ship, on her arrival at Barbadoes, was not put under restraint or quarantine, but communicated freely with the sea-ports of Barbadoes, the Saints, Antigua, and Gaudaloupe; landing the severally ill or dying subjects of that disease amongst the inhabitants, and at the Hospitals at Barbadoes and Antigua, without communicating infection at any of these places; and finally, after having undergone a thorough purification, sailing from Gaudaloupe for Europe, crowded to a very great degree with rebel French prisoners and their families from the jails, under the most dangerous circumstances of health, with a case of yellow fever actually dying on board the day before she left Basseterre roads, but without communicating any such fevers to the unfortunate passengers, leaving any behind her at Gaudaloupe, or importing any at the ports she ultimately reached." Dr. Fergusson, when speaking of an epidemic which took place in the following year, says, "what a different interpretation the facts I have collected would have borne, had the present epidemic that afflicts the islands broke out in the ordinary course of the seasons, a year earlier, at the time the Regalia was here." We shall only offer one more extract: "At Martinique they established a strict quarantine, particularly directed against Guadaloupe, and they have been consumed with yellow fevers; but at Dominique, Tobago, St. Vincents, &c., where they established none at all, they have not had, in as far as I have learnt, a single case, although at the last-mentioned islands both the Tigris and Childers ships of war imported distinct well-marked instances of the disease from *Point au Pitre*, on the evacuation of Guadaloupe."

Previous to closing this sketch of the question of contagion as connected with the importation of yellow fever into our West India colonies, it may be worth while drawing attention to an extract of a letter from Mr. Showers, ten years colonial surgeon of Sierra Leone, the first being the very year (1816) in which the Regalia sailed from that place:—"During my ten years' stay at Sierra Leone I never saw any other fever, [the ordinary fever of the country;] but when a fever broke out there similar to the yellow fever of the West Indies, (the year 1823 is here referred to,) attended with black vomit, which was supposed to have been brought there from the Mediterranean by a ship called the Caroline, this I recognised as a different fever from the one I have just described, from the common fever of the country; and to my knowledge none of the medical men then at Sierra Leone had any difficulty in distinguishing it as a new and different disease."[†] Mr. Showers adds, at the close of his letter, that respecting the fever of 1823, he had "his doubts whether it was imported or contagious; I am much of opinion that it proceeded from the atmosphere;" which doubts he was the more justified in entertaining from the known fact that for two years previous no yellow fever epidemic existed at any port in the Mediterranean. To those who had been led to believe that the true black-vomit fever had been not unfrequently *exported* from the coast of West Africa, its reputed birth-place, this visitation as a perfect stranger, and its alleged importation from Europe, must appear somewhat strange. The healthy state of the Regalia transport previous to her sailing from Sierra Leone, together with what appears by Mr. Showers' letter as to the non-existence of the yellow fever there in 1816, would seem to favour Dr. Fergusson's idea of its having been produced by the great quantity of green wood[‡] just laid in previous to her sailing, and to "foul ballasting that had not been changed for years." However it may affect the question of contagion, it would, considering the mass of evidence now before the public from various sources, be quite idle to deny the spontaneous breaking out of yellow fever on board of ships in the West Indies, and, more rarely, in other places: one of the best authenticated instances is that of the Bedford, seventy-four, in Gibraltar-Bay, so far back as 1794, of which there are official records at Somerset House. In that year yellow fever was not prevalent in the garrison, and the crew arrived in perfect health from the Mediterranean on the 24th of August. On Sunday the 6th of September, the crew having been mustered, every man answered to his name; but in the course of the week one hundred and thirty were sent to the hospital, with fever possessing the characteristic symptoms. eleven died before the 24th of September, and others were left dangerously ill on the departure of the ship that day. In this case the only feasible cause assigned was the shifting of the shingle ballast, after the ship arrived, with the object of *trimming* her. The disease did not extend beyond the sailors of this ship. The fact (considered at one time as an indubitable proof of the propagation by contagion) of the sailors of the British brig of war Carnation having been attacked with the disease when put on board the French brig Palinure, by which she was captured, near Martinique, in 1808, as stated in the *Dictionnaire des Sciences Médicales*, would admit of the explanation of their having, in common with the previous cases existing in the Palinure, originated from sources within this ship, and independently of *persons*. The following is among the most recent instances of the spontaneous irruption of black-vomit fever on board ship. His Majesty's ship Blossom had been for sometime employed in the summer of 1830, in surveying the Honduras coast; and in the month of August the disease commenced, which obliged the captain to go into Belise harbour, to obtain medical assistance from the garrison, into the military hospital of which forty-eight cases were received between the 11th and 30th of August: two officers and eight men died, and "these cases were attended with black vomit," according to the gentleman who had charge of them, assistant-surgeon Watts, of the second West India regiment, who had previously served in Jamaica, and who forwarded notes of the circumstances in his official return to the Army Medical Board for the quarter ending the 24th of September, 1830. Mr. Watts adds that the disease did not extend to the other ships, or to persons on shore. In a report from Dr. Lindsay, surgeon to the Blossom, to the heads of his department, relative to the event in question, he says, "I am of opinion that the cause of the present illness arose in the ship herself." Among the naval surgeons of the present day, of practical knowledge in this disease, we do not find many supporters of the doctrine of contagion; and among the observations on this point published of late years, Dr. Wilson's stand pre-eminent. The following from Mr. Mortimer, while serving as principal naval medical officer at Barbadoes, are forcible: "We do not allow the fever of the West Indies, commonly called 'yellow fever,' to be at all infectious in any of its forms or stages. We have never known of an instance of its communication to patients at the several naval hospitals, whilst under cure for other complaints, though such patients have never been interdicted, on the contrary encouraged to offer every additional aid for the greater comfort of their suffering brethren." (See Communication to Commissioners of Transports. —*Med. Chir. Rev.* vol. viii.)

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[*] At Gibraltar, during the epidemic of 1828, we observed this to have been the case in a very remarkable manner in some instances; and Dr. Ramsay, surgeon to the forces, states, in an official report, dated Barbadoes, 20th December, 1825, that "in certain barracks and hospitals the very diagonal of particular apartments will afford a tolerably accurate demarcation of safe and unsafe position of beds." See on this point also Dr. Wilson's work on yellow fever (1827), in which the disease is shown to have been confined to men whose berths were on a particular side, or in a particular part of a ship.

[†] See Mr. Showers' Letter, dated Malta, 27th July, 1830, in Dr. Aiton's Dissertations on Malaria, &c., 1832.

[‡] In the official report of Mr. Hartle, lately referred to, it is stated, on the authority of Mr. Mortimer of the Royal Navy, that the Nayden frigate having taken in green wood at Dominico, lost one-third of her crew by fever.

Passing now to the American continent, our limits admit but of a few brief remarks. Up to the year 1793, almost all the medical men in the United States were believers in the communicable nature of yellow fever; but each successive epidemic diminished the numbers, so that in 1825, according to an American commercial almanack, while five hundred and sixty-seven were against the doctrine of contagion, twenty-eight only remained in favour of it, throughout the whole country; the latter number being in all probability now reduced, as some of those mentioned were very aged. The public manner in which the celebrated Dr. Rush, once a believer in contagion, retracted his opinion, after farther observation, is matter of historical notoriety. At New-York the doctrine of contagion is still ardently supported by two physicians in particular,—Professor Hossack and Dr. Townsend, who have both written much upon the disease. The facts which presented themselves to Dr. Beck in the course of the last epidemic at New-York (1822), caused his public retraction of faith as to contagion in the following year, (New-York Med. and Ph. Journal, No. viii. p. 472); and Dr. Townsend appears to have admitted (*Chervin.* De l'Opinion des Médecins Américains, p. 11,) that, of about two hundred persons of all grades of the profession in that city, three or four only believed lately in the transmissible nature of yellow fever. "In 1793 the profession were almost unanimous in the belief of its contagious character, and no little courage was required to brave the storm an opposite opinion would have awakened. In this generation an equal unanimity prevails in the profession as to the non-contagious nature of the disease; and he who advances the opposite doctrine seriously, is deemed no more worthy of notice, much less a refutation, than would be an advocate at this time of the Ptolemaic system." (See Amer. Journ. of Medical Sciences, August, 1829, p. 523.) Upon this highly important question, the following unpublished statement from the pen of M. La Roche, French consul at Philadelphia, cannot but be important: it is extracted from a letter, which we have had in our possession, to a friend of his in Paris, dated the 20th of July, 1830. "A friend of mine, Dr. Morrel, has lately arrived from the Havannah. During a few days' passage three persons died of yellow fever on board, and a fourth, taken ill on board, died in the New-York quarantine establishment. The sick *were all cabin passengers*, and received the germs of the fever in the port. The other passengers, who merely embarked at the moment of departure, without having waited in port, remained well, and that notwithstanding the inevitable contact arising from twelve or fifteen persons sleeping in a small cabin. Dr. Morrel and the other passengers were placed in quarantine, but during the time every body went to see them."

Much interesting matter relative to the evidence on the subject of contagion in the yellow-fever epidemics which have from time to time prevailed in America, may be obtained by consulting various pamphlets published by Dr. Chervin of Paris, who has made the subject of yellow fever his particular study for many years of his life. In those pamphlets will be found evidence of zeal in the cause of science quite unparalleled, as well as of impartiality in his proceedings in search of truth. It is quite impossible in the present day, to meet the subject of contagion of yellow fever fully, without a knowledge of the nature and extent of his researches. Here, with a view of showing their value, we may give a few extracts from the commission appointed by the Academy of Sciences in Paris, in 1827, to adjudge the prize designed for labours in medical science. The *commissaires* were MM. Portal, Boyer, Chaptal, Dumeril, Dulong, Gay-Lussac, de Blainville, Frederic Cuvier, and Magendie.

The report made by the above gentlemen, after stating some unusual steps taken by Dr. Chervin to ascertain the contagious or non-contagious nature of the yellow fever at Guadaloupe, to which place he had proceeded from Paris, for the sole purpose of making investigations, proceeds thus:— "This is nothing!—It was, on the contrary, then that Dr. Chervin conceived the wisest and vastest plan that ever a medical man formed for the interests of humanity.

"It was no longer sufficient for him that he had satisfied himself that the yellow fever was not contagious in Guadaloupe; it became necessary to ascertain whether it did not possess that character in other localities and in other latitudes and climates. It was above all things necessary to convince the governments of Europe, so that commerce might be freed from unnecessary precautions, felt to be burthensome, and that nations might be saved great expense in sanitary establishments. In attaining his object, Dr. Chervin was only impelled by his ardent philanthropy — no other means, but the sacrifice of his patrimony — no support but his own inclination and physical powers — let it be declared to the honour of humanity, that by such means alone enterprises of this kind could be accomplished; and in fact, what a powerful government could scarcely hope to obtain at great expense, Dr. Chervin proposed to himself to obtain.

"Dr. Chervin performed this gigantic undertaking, to which the history of medicine furnishes no parallel, in a fortunate manner, but with unheard-of efforts, and perseverance above all praise."

Speaking of his having collected the evidence of hundreds of medical men in all parts of the world where the yellow fever is known to prevail, the report continues — "He visited, in eight years, all the colonies belonging to France, England, Spain, Holland, Denmark, Sweden: he visited all parts of North America, where yellow fever has shown itself, from New-Orleans to Portland, in the state of Maine; so that from Cayenne to this last place he traversed over and made investigations in 37 degrees of latitude."

"It [the commission] therefore proposes to adjudge him a prize of 10,000 francs: undoubtedly a poor reward for the many sacrifices, which he must have made; but when a person has, like Dr. Chervin, merited so much from science and humanity, and shown such disinterestedness, *on voit la couronne et non pas sa valeur.*"

In a work of high character (Dictionnaire de la Médicine et de Chirurgie, vol. v. article *Contagion*) Dr. Chervin's labours in the cause of truth are thus alluded to: "Observe, in regard to this last subject, [viz. the error of attributing to contagion what should be referred to local causes,] what occurred respecting the yellow fever epidemic of 1821, in the unfortunate city of Barcelona. Read the work of the French Medical Commission* appointed to examine into that epidemic, and it will be impossible for you, (admitting as true the statements therein contained) not to admit the existence of contagion. But afterwards, when you have read the precious documents collected by Dr. Chervin with a degree of zeal and patience truly admirable, you will rest convinced that the circumstances which led you to be of the same opinion with the commissioners as to the reality of contagion, are any thing but conclusive; thenceforward the idea of contagion will be effaced from your mind, *comme un vain songe;* and, pressed on every side by the evidence of observations, you will be compelled to attribute to *local* infection† those circumstances which, misled by inaccurate statements, you had placed to the account of contagion."

That in North America the disease has not been propagated by the removal of persons labouring under it, even when carrying with them their bedding, &c. has been shown by observations made there during many years by medical men (some even professed contagionists,) in instances of upwards of thirty cities and towns, according to a report upon Dr. Chervin's documents, read at the Academy. By those documents it also appears that attendants of all classes on yellow fever patients constantly remained exempt from the disease in that country, *where the hospitals were placed out of particular local influences.* This it appears was the case at the hospital at Bush-hill, near Philadelphia; in that of Belle-vue, near Fort Stevens; in that of the navy, at New York; also in those of Norfolk, Baltimore, Providence, Newport, Boston, and New London. These most important facts are verified by Drs. Chapman, Redmond Coxe, Mease, Lehman, Mitchell, Parrish, Jackson, Perkins, Miller, Tucker, Thomas, Bache, Harlan, Coates, &c. of Philadelphia; by Drs. Anderson, Brown, Walker, Drake, and Osborne, of New York; by Dr. Archer, of Norfolk; by Dr. M'Cauley, of Baltimore; by Dr. Weaton, of Providence; by Drs. Turner and Waring, of Newport; by Dr. Townsend, of Boston, and Dr. Lee, of New London. Proofs to the same effect collected in the West Indies, were laid before the Academy in 1827, by Dr. Chervin.

Dr. Pariset, medical chief of the quarantine department in France, has admitted that the yellow fever "is not contagious in America,—whether it had ever been so, or had ceased to possess that property."‡

With respect to South America, the points bearing upon this part of our subject have perhaps been more fully entered upon by Humboldt than by any other person. In his Political Essay, (vol. iv.) he mentions that at Vera Cruz the idea of the importation of the disease from the Havannah and other places had been from time to time entertained; but by the facts which he furnishes, there seems to be no reasonable cause for doubt as to the disease being indigenous at the former place. The subject of contagion is investigated by this celebrated man in the spirit of philosophy for which he is so remarkable: we are shown by him to what an extent one test of the communicable nature of a disease—that of taking people, actually ill of a disease, into healthy districts—has been applied, and the result proved to be entirely against the doctrine; that not only at Xalapa, and higher up in the interior, but at the farm of Eucero, a short distance from Vera Cruz, the disease is found to confine itself to the persons of those who may arrive with it in their systems from the latter place, notwithstanding the freest intercourse with others. Every observation made by Humboldt throughout his works, relative to yellow fever, is of high interest: one seems peculiarly deserving of attention; which is, that although the disease usually prevails among the newly arrived every year at Vera Cruz, it never prevailed epidemically there between 1776 and 1794, although the intercourse with the Havannah and other places where the disease continued to prevail, was quite free. He even says that during the eight years preceding 1794, "there was not a single example of the *vomito*, although the concourse of Europeans and Mexicans from the interior was extremely great, and the sailors gave themselves up to the same excesses which are now laid to their charge."* Such a fact is the more worthy of notice, as it does not appear to have depended on unusual atmospheric states during this period; and one can scarcely concede any very great degree of importance to the circumstance of the streets of that city having been for the first time paved in the year 1775, seeing that the disease has recurred so often since 1794, and has prevailed so frequently in the well-paved streets of St. Pierre Martinique, of Cadiz, Seville, Gibraltar, &c.

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* At the head of which was, be it remembered, Mons. Pariset, Medical Chief of the Quarantine Department.

† We know that in France the word *infection* is exclusively applied to *places*, not to transmission of a disease, directly or indirectly, from person to person.

‡ "N'est point contagieuse en Amérique, soit qu'elle ne l'ait jamais été, soit qu'elle ait cessé de l'être." Bulletin des Sciences Méd., tom. xii. p. 126.

To turn now to a view of the question as to whether this disease has been proved in Spain to have possessed the property of propagating itself from person to person, immediately or mediately, it appears that so far back as 1761, (21st October,) a royal edict was issued at Madrid, which set forth that all experience of the intercourse between the Havannah and Cadiz had proved that the black-vomit fever was not contagious. It would appear from this that the opinion of the court physician Cervo, sent to inquire into the nature of the Cadiz epidemics of 1730 and 1731, had been more regarded than that of Navarette, who attributed their origin to importation from America. It seems very curious that the late Dr. Arejula of Cadiz should, when he wrote his work on yellow fever in 1806, and which is so valuable in many respects, have laboured under the great error of the black-vomit disease of the Havannah, Vera Cruz, &c. being a different disease from that now so generally known by the name of yellow fever, and admitted to be identical. He appears in the strange dilemma of contending for the contagion and importation of the disease under one denomination, (*yellow fever,*) while he admits freely that in America "a succession of ages proved to the medical men that the disease was not communicable:"—and speaking of Spain, that "our ships never brought the germs of the black-vomit, even though they had the disease on board when leaving our possessions." This physician, with Drs. Coll and Amellor, also of Cadiz, made a declaration that the medical men commissioned to inquire into the causes of the epidemics of 1732 and 1734, pronounced it not to have been propagated by contagion. In all subsequent epidemics, a great majority of the Spanish practitioners have favoured the doctrine of importation and contagion; but it would appear from the assertion of Professor Salva, of Barcelona, in his *Trozos ineditos,* that the public opinions of some had been influenced by political or other causes, for he does not hesitate to state, that when with a view to illustrate the subject of the contagion of yellow fever, he applied for information, private opinions as to its not possessing that property were obtained from some of those who had publicly declared the contrary. A commission, instituted at Cadiz to inquire into the origin of the epidemic of 1810 in that city, declared that in none of the six epidemics which had appeared previous to 1805, could the origin of the disease be traced.† The importation of the disease alluded to by the commission as having taken place in 1805, had reference to the disembarkation of about two hundred cases from the fleet of Admiral Gravina on its arrival from the West Indies. The commission admit that though many of the cases had the most characteristic symptoms, and though the communication with the city was completely free, "the disease did not spread, nor was it in any way communicated." It is also stated that though many cases were sent to the Aguada Hospital at Cadiz from a French fleet in 1807, with which a free communication was permitted, the disease did not spread. In addition to the authorities cited at the commencement of the present subject, many details connected with the origin of yellow-fever epidemics in Spain up to the year 1820, and which cannot possibly be entered upon in detail here, are to be found in Hurtado's "*Nueva Monografia;*" in his "*Decadas;*" in Mr. Doughty's book; in the writings of Dr. Pariset; and in various pamphlets published in Paris since 1827 by Dr. Chervin.

Regarding Gibraltar in particular, we may be allowed to state that a residence there within the last few years brought us into frequent contact with a gentleman who had been present during the existence of the disease in the years 1810, 13, and 14,—Mr. Amiel, many years on the medical staff of Gibraltar, and now surgeon to the 12th regiment. The evidence of this gentleman, comprising the fullest details upon every point, goes to refute the statements made regarding the importation of the disease at any of the periods in question, and is fully corroborative of the evidence upon the subject placed before the public by Sir W. Burnett and Dr. Bancroft. The only forms in which Mr. Amiel's statement have come before the public are, a short memoir printed at Gibraltar, and a paper to be found in the Edinburgh Medical and Surgical Journal for April 1831. We have been assured by him that the impression given (see Pym on the "Bulam" Fever) by the present superintendent of quarantine in this country, as to the disease having been cut short in 1801 by his recommendation of segregating the cases, is utterly fallacious; for, as has also been specially certified to us by Dr. Bobadilla, another practitioner resident during many years in Gibraltar, the progress of the disease was stopped *as it is always found to be,* by the setting in of a cold wind from the north. It must be obvious that placing a point like this on its true footing is of the highest importance to the public. Notwithstanding the body of evidence on record against contagion in all the Gibraltar yellow-fever epidemics up to the year 1814, and though from Bancroft's works it appears that among the medical men of that garrison the majority of opinions had been greatly against it, it was nevertheless impossible that unbiassed persons should be uninfluenced by the statements published by two officers of the quarantine department, (Ibid.—Fraser's (W. W.) Letter to Lord Chatham), who, having been on the spot, had ample opportunities of arriving at the truth on such points. The circumstance here alluded to is the assertion that, during the epidemic of 1813 at Gibraltar, the people employed in the dock-yard there, having been strictly separated from the rest of the garrison, remained free from the disease. Here, then, was evidence fully in support of the utility of quarantines, and of the propriety of separating, on future occasions, the healthy from the sick. But what was the astonishment of the profession on finding that mis-statements had here taken place of facts, as shown by Dr. O'Halloran, (O'Halloran on the Yellow Fever of Spain, p. 168,) who had served in a regiment at Gibraltar for some years subsequent to the period. During a residence at Gibraltar, we had ample means, by referring to the declarations of the official authorities at the dock-yard, of confirming the assertion of Dr. O'Halloran as to several cases of the fever prevalent in 1813 having occurred there, as well as some deaths; indeed the names of twenty-three (of which seven proved fatal) could be here given were it necessary: so that regarding the original statements, no impressions favourable to the accuracy or candour of the quarantine officers who made them can be entertained; and in the justly severe remarks of Dr. O'Halloran on the subject, to which no reply has been made, future observers of circumstances connected with the public interest have received a salutary warning.

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* Political Essay on the Kingdom of New Spain, vol. iv. p. 194. Dariste, who practised in Martinique for some years, informs us of a similar exemption at that island between the years 1807 and 1816; and that old inhabitants remarked intervals of even twenty-five years between epidemics.

† "En ninguna de estas epocas, exceptuada la de 1805 en que vinò de fuera, se ha podido averiguar con exactitud, el origen de esta calamidad publica." "At none of these periods, except 1805, (in which it was imported) could this origin of this public calamity be determined with exactness." *Extract from the Report of the Commission.*

The terrific epidemic of 1831 at Barcelona gave a new impulse to the question of the contagion of yellow fever. The statements furnished by the medical commission sent from France* to make researches into the nature and origin of that disease, left a strong impression on the minds of many in the profession favourable to its possessing a communicable property; and the "*Histoire Médicale*" displays literary powers of a high order on the part of Dr. Pariset, who was at the head of the commission. The same gentleman, however, (Dr. Chervin,) who had devoted so much time and labour, as already shown, in procuring authentic information in the West Indies and America relative to the question of the transmissible nature of the yellow fever, followed Dr. Pariset step by step some time after, not only at Barcelona, but through all parts of Spain where circumstances had been detailed respecting the propagation of the disease. The result has been,—not a mere series of assertions against assertions,—but a collection of documents duly authenticated, such as had never before been laid before the public on any question of this kind. As elucidating a long-pending question of high importance to society, their value may be judged of from the opinion of the Academy of Medicine, which has been already referred to. We regret that space will not permit our furnishing many valuable extracts from the works of this gentleman, published in 1827 and 1828.† We are furnished with the statements of Dr. Pariset and others regarding a multiplicity of events connected with the appearance and progress of the yellow-fever epidemics of Spain; and it cannot but be admitted, we think, that Dr. Chervin has shown, in a manner the most conclusive, that many inaccuracies had crept into those statements, and that the events warranted conclusions quite opposite to those which had been come to. Dr. O'Halloran, who went to Barcelona to observe the epidemic of 1821, had, previously to Dr. Chervin's visit there, pointed out some of the most important errors of Dr. Pariset; and in his book, already referred to, some interesting statements are furnished relative to occurrences at other points.

An event very remarkable in the history of yellow fever, and but little spoken of in England, occurred in 1823 at the little port of Passages in the province of Guypuscoa, a place well known to many British naval and military officers, it having been the rendezvous for transports while the British troops occupied the Pyrenees in 1813–14. It is difficult to give an idea of this singular port, situated at the bottom of the Bay of Biscay, and forming a sort of appendage to St. Sebastian's, from which it is distant but a very short way. The entrance is between precipitous rocks, and is so narrow and oblique as to be with difficulty discoverable at a very short distance. This miniature town consists for the most part of one small street, placed as it were on a shelf of scarped rock, and so narrow that it does not admit of the passage of carts or horses, while the rock forming the base of the mountain of Olearso is in some places literally in contact with the houses, which are badly ventilated, filthy, dark, and crowded. Let us take the events in question from the account given of them by Dr. Arrutti, a physician long resident in that part of the country, and who, while he would lead us to believe in some places that he considered the disease within certain points contagious, yet relates the facts which took place under his observation with such perspicuity and candour, that it is impossible to perceive the smallest intention on his part to mislead. We are informed that, in June 1823, a brig named Donostiarra sailed from the Havannah with a clean bill of health; and that having lost one man on her voyage, (from ordinary disease as far as was known,) she obtained pratique in the usual way at Corunna, after ten days' quarantine. She subsequently put into St. Andero, and arrived at Passages on the 3d of August, with all on board in perfect health. This vessel had been latterly employed in the trade of these ports. As she had been at Corunna and St. Andero previous to her arrival at Passages at the date just mentioned, she was not put into quarantine at the latter place. The cargo consisting chiefly of sugar and tobacco, was discharged soon after her arrival; and for several days a great many people of all classes went on board, but without any disease having broken out among those individuals, among the crew, or in the part of the town where the cargo had been deposited. On the 15th, a custom-house officer, who had been several days on board, was taken ill, and he died on the third day, black-vomit having appeared. This man was said to have been much engaged in the hold looking after contraband goods. On the 22d, a man who had been down for some time in the hold surveying the ship's timbers, likewise died. Some of the planks of one of this vessel's sides having been found greatly decayed, twelve carpenters were employed in removing them, and six of the twelve were attacked in quick succession. The opening in the side of the ship commenced on the 19th, and on the 23d the disease began to appear in an unequivocal form in the houses close to which she was moored. Dr. Arrutti proceeds to show *in detail*, and in the most satisfactory manner, that the disease did not extend beyond a certain number of houses at or near the *Plazuella de la piedad*, opposite the ship; that where others were attacked whose habitations were at a distance, it was occasioned by their having remained for some time within the space to which the malaria from the ship appears to have been limited, and the names and occupations of those persons are given. The heat was excessive in the middle of September, being, as he states, 28½° Reaumur, (about 96° Fahr.,) and the course of the wind favoured the conveyance of the noxious emanations from the ship to the houses near it: he gives the number of each house in which persons were attacked, and names the points beyond them to which individuals labouring under the disease went, and where, notwithstanding the adjuncts of *crowded, filthy, and badly-ventilated habitations*, the disease did not spread beyond the individual; for as he says, "whether they died or recovered, to none out of the focus was the disease communicated." (Page 70.) In the same page he says, "The inhabitants of Passages took the precaution of not making long delays in the focus of infection; they visited their relatives and friends, and performed towards them all the rights demanded by humanity and society, and the disease became extinct almost in its very origin." He observes, "It therefore results that this fever, examined according to the character it presents, does not offer a character of contagion from individuals." (Loc. cit.) And again, "It was afterwards discovered that many, evading the sanitary regulations, passed out without certificates of health, and took with them clothes, even from the houses where people had died; but notwithstanding this, there was not the least spreading of the disease in the neighbouring country. If any deaths took place in Loyola, Renteria, or elsewhere, the disease in such cases had been contracted within the focus of infection." Finally, Dr. Arrutti observes, "If this disease had been transmissible by individual contact, what could have put a stop to its progress?—no human power: for the people who had been in the closest contact with sick, convalescents, and clothes belonging to the sick, distributed themselves, when the cordon was about to be placed, at St. Jean de Luz, St. Sebastian's, Bayonne, and other places." Here then, as we are necessarily obliged to conclude, is an instance—not of yellow fever imported,—nor, rigidly, of *the cause* of yellow fever imported, but a development of the disease by the concurrence of a certain number of agents. On other occasions yellow fever has been observed not to break out until vessels had been cleared of their cargoes; and in this instance the great heat which is stated to have occurred, reverberated as it must have been from the mass of rock close to which the lightened ship was moored, may be easily understood as having been highly favourable to the extrication of a noxious principle from her decayed planks.[*] In another account of this epidemic, given by Dr. Montes in the 14th vol. of *Hurtado's Decadas*, its origin is attributed to sources within the town itself, and totally independent of the ship, as publicly declared at the time by Dr. Zeubeldia; and that a similar epidemic prevailed there in 1780.[†] There is no discrepancy, however, in the statements as to the disease not having been propagated from person to person; though, as before intimated, Dr. Arrutti seems to apply the word contagion[‡] to the extension of the disease within the limits of the noxious emanations from the ship. It appears that no inspection, such as took place in the case of the Pyramus, had been instituted here. From Dr. Arrutti's statements we can now comprehend the possibility of some fever cases having occurred among the men of this last ship, while they were living in the dock-yard at Antigua, even without their having, as stated, gone on board secretly.

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* Dr. Pariset, medical chief of the quarantine department, with Drs. François and Bally. This is not an occasion to enter on the alleged political motives by which this commission might have been influenced, with a view to favouring the adoption of the famous *cordon sanitaire*, previous to the invasion of Spain in 1822.

† In the "*Revue Critique*" by Dr. de Fermon of Paris, printed in 1829, a *resumé* of the occurrences here spoken of may be found.—Dr. Reider, of Vienna, who has also made yellow fever the subject of particular investigation, and undertook, for the purpose, voyages at different times to the West India Islands and the American continent, states, in a memoir published at Vienna in 1828, that the disease "was never imported into Europe or anywhere else;" and that "it never originates in, or is propagated by contagion." He deplores the manner in which governments are misled, and the best interests of humanity sacrificed, by those who endeavour to maintain the present system of quarantine.

As, in the same year in which the above occurrences took place at Passages, another remarkable circumstance occurred, which has been frequently alluded to, it may be here mentioned, previously to referring to the events connected with the subject of contagion in the last epidemic to be noticed.

By an official report drawn up and published in 1824, by Dr. (now Sir William) Burnett, one of the commissioners of the Medical Department of His Majesty's Navy, it appears that in the early part of the preceding year a fever made its appearance at Sierra Leone in a form different from the usual remittents of the country, and stated to possess symptoms characteristic of yellow fever. The importation of this disease by the merchant-ship Caroline, as at one time alleged, is completely refuted in this report; and at page 24 an extract of an official document from the gentleman at the head of the medical department at Sierra Leone is given, in which it is stated, that from all the evidence which could be procured in the colony, there was reason to conclude that the disease was *non-contagious*. A curious circumstance, to which there is perhaps no parallel on record except that which, as formerly stated, occurred under our own observation in the West Indies in 1801, is related by this gentleman, viz. “that European females and children were perfectly exempt.”

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[*] The origin of this disease at Passages, from sources on board unconnected with the death of the individual during the voyage, has been, on one occasion at least, admitted by Dr. Audouard of Paris, a professed contagionist.—*See Revue Médicale, Sept.* 1824, *p.* 38.

[†] We were not aware that yellow fever had appeared at any other point on this part of the Spanish coast, till looking over lately the official report from Dr. Bone already referred to. This gentleman says, "At St. Ander, in 1813, none of my assistants, orderlies, [army attendants on sick,] or nurses, employed with the cases of yellow fever treated in the *Casa blanca* in the quarantine hospital, were attacked with it."

[‡] We had been long in communication at Gibraltar with a Spanish practitioner of great experience, (Dr. Bobadilla), and considered him for some time a believer in contagion, in the sense of direct or indirect transmission of a disease from one person to another; but to our surprise he assured us, that, at an hospital in Los Barrios near Gibraltar, some years ago, he explained to every body how the attendants of all classes on yellow-fever patients were not more liable than others to attacks

Under date of the 23d December, 1823, a statement was circulated through the army by Sir Gilbert Blane, calculated certainly more than any thing which had previously appeared to prove the importation and subsequent diffusion of yellow fever by persons labouring under it. It appears that His Majesty's sloop-of-war the Bann left Sierra Leone for the Island of Ascension at the latter end of March, 1823; that a malignant fever, of which several died, prevailed among the crew, during and for some time after the voyage; and that, on the eighteenth day after her anchoring at Ascension, a disease alleged to have been similar, and in some instances accompanied with black vomit and yellow skin, broke out in the small force composing the garrison of that island, which consisted of thirty-five individuals, officers and men of the marines and artillery, besides women and children. It appears by the details given in Sir William Burnett's report, that an error (of little importance perhaps) had crept into Sir Gilbert's statement regarding the perfect health of the crew of the Bann when she left Sierra Leone; but what is of very great importance has been omitted by the latter gentleman in his letter, though supplied in the very candid statements of the former,—viz. “On reference to the journals of medical officers who at different times had charge of the garrison before the appearance of the late epidemic, an abstract of which is in the Appendix, not only has dysentery and hepatitis been very prevalent, as well as occasional attacks of fever, but likewise a fever called the bilious remittent, in the year 1818, attacked almost every man on the island, which the assistant-surgeon attributes to an unusually wet turtle-season, when the men are much exposed by watching at night to turn these animals. Moreover there is, in the journal of Mr. Robert Malcolm for 1818, a case of this disease, which commenced on the 1st of June, and terminated by death on the next day, with all the symptoms of yellow suffusion and black vomit, &c., which are said to characterize the yellow fever; and having shown this case to the surgeon of the Bann, now in London, he declares it to be exactly similar to the cases of fever which lately proved so fatal in the Bann, and amongst the marines at Ascension.” (Page 10.) Here then, whatever might have been the nature of the disease which prevailed in the Bann and at Ascension in 1823, we have evidence of *the existence of the same disease in the island, and about the same time of year, in* 1818, *without the remotest suspicion of its having been then imported.* This, on the obvious principle that what may in one year happen on a small scale, may, from an extension of the cause, happen on a larger scale in another year, greatly enhances the force of the concluding part of Sir William Burnett's sixth position, “that a disease similar to the fever in the Bann might have prevailed in that island though the Bann never had any communication with it.” (Page 52.) He tells us that “the principal medical officer at Sierra Leone has come to the same conclusion in his official report;” and we suspect that, closely investigated as questions respecting the present subject have lately been, and greatly augmented as the facts bearing upon the question of contagion have been within the last few years, the majority of the profession who have paid attention to yellow fever will be likely to come to the same conclusion, rather than admit as a *propter hoc* that which, as far as any evidence goes which has yet appeared, was simply a *post hoc*. Sir William, though favouring, under all the circumstances, the belief of the importation of the disease on the above occasion, candidly leaves the question open, and furnishes all the details within his reach, to enable the profession to form an opinion. He points out erroneous statements as to the particularly healthy state of the island from the period of our occupying it (1815) to the epidemic year 1823. He says, “Out of one hundred and thirty cases of disease which are recorded in these journals, twelve died and nineteen were invalided; and though perhaps all the fatal cases are inserted in the journals, it is well known that those documents seldom contain more than a third of the cases which actually occur.” He tells us that, although at the time of the arrival of the Bann, the little garrison was in good health, and that, according to the medical gentlemen in charge, although at a period immediately preceding this event “they were on the whole very healthy, yet they were by no means exempt from disease.” (Page 11.) He admits “that after a most careful inquiry it is impossible to trace the fever in question directly from the Bann to any individual of the garrison of Ascension,” (page 53); and indeed it appears that the first person attacked with the characteristic symptoms was not one of those known to have been in the ship or in contact with the sick, but a boy, on the 11th of May, respecting whom “it is neither known nor believed that he had any nearer communication with the sick of the Bann, than passing daily at no great distance from the tents to feed his father's poultry, and he was never on board that ship.” (Page 14.) The tents here alluded to were, as pointed out by Sir William at page 5, occupied as an hospital for the accommodation of the sick from the Bann immediately on her arrival, and were situated at about five hundred yards from the garrison, and *all intercourse was interdicted.* He informs us that up to this time the restrictions on the intercourse between the ship and the garrison had not been much attended to, several individuals having been on board after the landing of the sick; but that from the time of the boy's illness “every proper precaution was taken for preventing the extension of the disease to the outposts; notwithstanding which, six men, two women, and seven children, were taken ill at Springs, but fortunately none at the Green Mountain, though one of the men belonging to that post had been on board the Bann at the sale before mentioned." We shall only add that the surgeon of the Bann, "an excellent and intelligent officer," ascribed the disease to the long stay of the ship in port at Sierra Leone, where the crew had been much exposed to the sun's rays in refitting her rigging, &c.; and that when this vessel had been, in 1821, on the Jamaica station, a fever, with yellow skin and black vomit in some of the cases, appeared among a party of forty men, put on board for a passage, who had suffered imprisonment with hard labour at Panama for four months, (page 47); which disease, according to the surgeon's journal, did not extend to the crew, nor could he "trace a single instance of disease to contagion," although "the smallness of the vessel, and other circumstances, would not admit of a separation between the sick and ship's crew."

That there were, on a *primâ facie* view of the irruption of the fever in Ascension, reasonable grounds for suspecting the agency of contagion, there cannot be a doubt; but, as may now be seen, it is far from being established by any thing like legitimate induction from evidence, that the one was the cause of the other; and, added to all that is now known upon the subject of yellow fever, many will probably join with us in believing that, admitting the transmission of this disease from individuals in this instance, would be illogical and nothing short of admitting that to be *vrai* which is shown to be only *vraisemblable.*

We shall close this essay by referring to some of the facts bearing on the subject of contagion, as they occurred during the yellow-fever epidemic at Gibraltar in 1828,* when it fell to our lot to observe its rise, progress, and termination. For minute details, full of interest, we can confidently refer to what has since been published by the following gentlemen of unquestionable veracity:—Mr. Wilson,† attached for many years to the duties of the Civil Hospital at Gibraltar; Mr. Hugh Fraser,‡ in charge of the Civil Hospital for some years, having previously served there in the 12th regiment; Mr. Amiel, (Edinburgh Medical and Surgical Journal, April, 1831,) now surgeon to the 12th regiment, a gentleman who has been for more than thirty years in His Majesty's service, and had witnessed the disease at Gibraltar in the former years specified, as well as sporadically on other occasions; Dr. Smith, (Edinburgh Medical and Surgical Journal, No. 106,) surgeon to the 23d regiment; and Dr. Chervin,§ one of the members of the medical commission which arrived at Gibraltar from Paris towards the close of the epidemic of 1828. Besides these, the French government has published a series of documents furnished by the medical commission, to which is appended, on the part of one of them (Dr. Chervin), a declaration that statements of some consequence afterwards shown to have been erroneous, had obtained a place in the collection.

After having paid the utmost attention to every point connected with the first appearance and progress of the epidemic in question, it would be an utter dereliction of our duty towards the public, to attempt, under the guise of extreme candour, to cast unwarrantable doubts on the many important statements made by the gentlemen whose names are above given, in proof of the disease not having been imported, and of its not having, under any circumstances, been communicated from person to person: we are enabled, on the contrary, to declare that most of the important facts cited by those gentlemen in proof of non-contagion, were verified under our own observation while on the spot. A reference to some of the publications pointed out in the notes will show how individuals have been publicly denounced to the world as having garbled and distorted circumstances in a manner which must for ever hold them up to the indignation and contempt of the profession at large. Indeed we cannot but regret that usage will not permit, on an occasion like this, an exposure of the conduct of interested persons, whose foul labours were directed to pervert truth on a question upon which, for generations to come, the lives of thousands must depend, and for which they so well merit exposure and punishment.

At the commencement of the epidemic there were very few medical men in the garrison who could be called anti-contagionists. Conceiving that our then medical chief, the late Dr. Hennen, was disposed to make up his mind too soon against importation and contagion, some of us wrote to him, indeed, confidentially, requesting that he would give further attention to the reports regarding the importation of the disease by a Swedish ship from the Havannah, called the Dygden; but an impartial consideration of all the facts which passed in evidence before us subsequently, left no doubts in our mind as to the cause, though mysterious in its essence, being of a strictly local nature. At the strangely-constituted board appointed at Gibraltar to inquire into the origin of the disease, and at which, to the astonishment of all who had read the works of Bancroft and Burnett, the present superintendent of quarantine in England was named president, much passed over which a veil must be drawn here; and we shall only place on record the full opinions of two of the members, they being certainly most entitled to weight with the public. Mr. Judge Howell says, "Upon a careful review of all the proceedings before this

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* Here as matter for future reference, a view of the mortality from yellow fever at Gibraltar is given for five years in which the disease appeared there to a remarkable extent, from 1804 inclusive.

Years	1804.	1810.	1813.	1814.	1828.
Military and their families	869	6	391	114	507
Civilians	4,864	17	508	132	1,170
Total	5,733	23	899	246	1,677

† See papers in Nos. 352, 353, and 354 of the Lancet, which were translated into French and notes added by Dr. Chervin, in 1830.

‡ Papers in London Medical and Physical Journal, March, April, and May, 1831, and in Medico-Chirurgical Journal, January, 1831.

§ *Lettre à Monsieur le Docteur Monfalcon. Réponse à Monsieur le Docteur Lassis. Réponse à Monsieur Guyon.* Letters in the *Gazette des Hôpitaux*, 27th August and 10th September, 1831.

‖ Dr. Smith, 23d regiment, and the writer of this, surgeon at the time to the 43d regiment: the letters here referred to were found in Dr. Hennen's office after his death.

board, I am of opinion that the evidence brought forward has totally failed to prove that the late epidemic disease was introduced from any foreign source, either by the Swedish ship Dygden or by any other means; and I am further of opinion that the late epidemic had its origin in Gibraltar." Colonel Chapman (now Major-General Sir Stephen Chapman, Governor of Bermuda) says, "Judging from the evidence produced before the board, the manner in which it has been given, together with the description of persons who have been brought forward as witnesses, I am decidedly of opinion that the late epidemic disease is of local origin. As to the importation of the late epidemic, I am of opinion that the attempts to prove the introduction of the disease, after months of previous inquiry, by those who wished to prove it, have totally failed." The latter part of this needs, we presume, no illustration. Three voices, including that of the president, were in favour of the importation of the disease; according to another member, it might have been from foreign and local causes conjoined; while the seventh (the captain of the port) declined, through delicacy, recording an opinion.[*] On the above occasion the examinations of some of the medical gentlemen attached to the army were most imperfect, *the progress of the disease among the men under their charge not having been entered into; and several of them were not examined at all!*

That a local cause of yellow fever, unconnected with persons, was in operation through a certain space at Gibraltar, in the latter months of 1828, was amply demonstrated in every possible way in which such a point could be proved. To some of the most striking occurrences bearing on the subject we shall here revert, leaving, for want of space, many valuable details, as they have been furnished by the several gentlemen formerly referred to. The failure of proof as to the importation of the disease has been admitted by the army medical board in England, to whom a copy of all the procedings of the Gibraltar commission was sent for examination. It was shown that the disease made its appearance exactly about the same time of year as on all preceding epidemics at Gibraltar and other parts of Spain;[†] and that, as on all former occasions, the morbific influence was limited to the western face of the rock, and to a small village (occupied by fishermen and by a small military post) situated at the base of the rock, on its eastern side. On the sandy plain called neutral ground, several thousand of the civil population, as well as three regiments of infantry and some sappers, were placed under canvass or in huts, soon after the epidemic made its appearance: on two plateaux, situated at different elevations on the southern extremity of the rock, (Windmill-hill and Europa-flats) three other regiments, with a detachment of artillery, were also encamped. Although very great intercourse subsisted during several weeks between the places where the disease prevailed and the three points here specified; and though, up to the appearance of the last case, there were no measures in force which could be considered efficient in a disease avowedly contagious, — for medical men fresh from their full wards were daily in contact with the healthy persons in the camps,—still the disease did not attack the persons on the neutral ground, or on the plateaux, unless duty or occupation obliged them to pass certain limits, and respire, for a longer or shorter time, the atmosphere of particular localities — the part of the town itself, called the 24th district, being the most dangerous of any. If any cases had their origin beyond the points spoken of, they must have been very few in number, as among our army medical friends at Gibraltar, by whom the point had been frequently discussed with us after the epidemic, scarcely a single well-authenticated case could be made out, among the military or their families, where an attack had taken place among those who had not entered the regions of malaria.[‡]

The following facts have been placed on record relative to this epidemic; it will be perceived how far they are calculated to set at rest a question of prodigious importance to a great portion of mankind. With scarcely any exceptions, security from attacks was obtained by the military and civil part of the population at the three points of encampment mentioned, as well as on board of ships lying in the bay, to which many of the latter fled. It was shown that, though many individuals who had been in close contact with the sick in the town, &c. had removed to camp, taking with them their bedding and some furniture, no spreading of the disease in the camps or huts took place. Up to about the 20th of October, the convalescents underwent no process of purification previous to their being sent from hospital to their respective camps. By reference to Mr. Hugh Fraser's papers it will be seen that this gentleman, who was surgeon to the civil hospital, had, for want of room, been obliged to discharge a great number of persons from that establishment before their convalescence had been well established,—some indeed with hemorrhage still from their mouths, — that several of these people took with them articles of bedding to the small tents and huts in which their relatives resided, without the disease having been transmitted to the latter. By Mr. Amiel we are shown that his regiment (the 12th) became soon free from cases after they encamped on the neutral ground, a few only having occurred among men who may be supposed to have carried out the seeds of the disease in their systems; — that so long as this regiment sent no men into town on duty, no attacks took place; but when the town duty was resumed, cases again occurred, and exclusively among those men who had been so employed. He gives us the important fact, that "ninety-two women of that regiment, and one hundred and ninety children, who never were allowed to repass Bay-side barrier, continued perfectly healthy; and one woman only, (the armourer's wife,) who, during the period, obtained leave to enter and stay a few days in the garrison, caught the fever and died of it. Several of these women passed the night in the same beds with their husbands, attacked with and labouring under the epidemic fever; and, besides, continued, as well as their numerous children, to use the same bedding, after the men had been removed to hospital; but in no instance was the disease contracted by the wife or the children after that full exposure." Were we to point out one situation more calculated than another to favour the transmission of a disease by personal contact, it would be that of several individuals living in the small space of a tent or hut; yet we see that, put to this test, there was no transmission. Dr. Smith, in his paper referred to, shows that in the 23d regiment, the disease, notwithstanding exposure to direct or indirect contact with the sick, was also confined to those who had been within certain bounds; and he exposes fallacies in certain statements relative to people on board vessels in the bay, whose safety, we can join him in averring, did not arise from their having been cut off from communication with persons or things from the town. In a regiment, (43d,) of which we had, on the occasion in question, the medical charge, we can aver that on summing up all the occurrences, the following clearly appeared: that although our regular hospital servants had been greatly harassed at an early period of the epidemic by attendance on yellow-fever patients, none of them were attacked until nearly one month after the admission of the first case; not, indeed, until the disease had attacked individuals who were not employed in attendance on the sick, but lived on that part of the rock where the hospital* is situated:—that, in the course of the first month of the epidemic, a party of temporary attendants, consisting of from two to four, or more, was sent daily from a remote barrack or camp to do duty in the wards of the hospital for twenty-four hours; their employment absolutely comprised whatever can be conceived of the most assiduous nursing during the night as well as by day; and the result, according to an investigation made afterwards, was, that, in the first place, no greater proportion of the sixty-nine men (the total number so employed) had been attacked, than of the whole mass of the regiment which had not been on this service about the sick; and that, in the next place, any of them who happened to be attacked within a period of several weeks after, were ascertained to have been on duty (guards, &c.) within the points where the atmosphere was most deteriorated. Here, then, we have, in a manner, an *experimentum crucis*, on such a scale as cannot be denied to give it the highest importance in the eyes of the profession. We took the precaution to have the names of these sixty-nine men, together with other particulars, duly registered and verified by the adjutant of the regiment, in a document forwarded to the office of the colonial secretary in London. The next remarkable fact regarding attendants on the sick was, that of several medical men (six or seven of whom had but lately arrived at Gibraltar) employed at an hospital on Windmill-hill, and at another in a low situation near the neutral ground, not one suffered from the disease: the same immunity was extended to the servants employed *at those points*, among whom were some who, not having passed through former attacks, could not be said to have escaped on that account. We took great pains to procure the names of the women who washed for the sick of the army during the epidemic, and it can be confidently stated that the result of inquiry, as to the numbers attacked, was quite in opposition to the doctrine of the disease being communicated indirectly by means of articles of dress, &c. Another point to be considered is, whether immunity from attacks took place where pains had been taken to exclude all communication, direct and indirect, with the sick. At the dock-yard this did not, in 1828, prevent individuals from being attacked; neither did prisoners confined in solitary cells at the "Moorish Castle," situated within the walls of the town, escape attacks. We are aware, too, that among the private families on the western face of the rock, who took precaution by seclusion, cases also occurred. On the neutral ground, on Windmill-hill, on Europa-flats, as well as in ships in the bay, persons who thought proper to adopt precautions may be said to have escaped; but the same, we are quite sure, may be said of those who, *living there*, adopted no such precaution as shutting themselves up. The only step holding out security at Gibraltar or anywhere else, as is now so generally understood everywhere, and as had been practised many years ago in some parts of Spain, is to remove quickly from the malaria points; and this, according to all experience, would seem a measure eminently entitled to the appellation of *sanitary*.

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[*] To show the facility, at any time, of falling into the error of assigning, as a cause of the Gibraltar fever, that which may be only a coincidence, the above gentleman laid before the board a document showing that between 1814 and 1828, *eight hundred and forty-four ships had entered there from different countries where the disease is known to prevail.*

[†] The first cases usually appear in August, though *avant coureurs* have been not unfrequently observed in July. On one occasion only, as far as we are aware of, has an epidemic appeared earlier in Spain—that at Malaga in 1804, which broke out in June.

[‡] At one time the writer of this essay, not aware that this was found to have been so generally the case, gave it as his opinion officially, that the morbific principle might, during epidemics, occasionally affect persons a few hundred yards beyond the rock.

[A recent writer, Dr. Monette, (*Western Journal of Medicine and Surgery*, Louisville, 1842), in a series of papers in which he has brought forward much evidence in favour of his views, whilst he is far from advocating "the absolute and unconditional contagion or infection of yellow fever, and that it has the property of communicating itself from one individual to another in a pure and free atmosphere," — contends, that under certain circumstances, independently of all local accumulations of city filth, the local atmosphere becomes so contaminated by a healthy population, that it is peculiarly adapted for the dissemination of yellow fever, when a portion of infected air is introduced. At times, he considers, the introduction of a moderate quantity will be sufficient; at others, when the atmosphere is less prepared, a larger quantity is required; and hence he deems the quarantine regulations most important for the protection of the citizens of such towns as are liable to the visitations of this malignant disease.]

The foregoing materials, drawn from sources so varied, will probably aid the profession at large in forming an opinion upon a long agitated question.

J. Gillkrest.

FRAMBŒSIA.—See Yaws.

FUMIGATION.—See Disinfection.

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* A fine building, calculated for the accommodation, under ordinary circumstances, of the sick of five or six regiments,—situated at an elevation of one hundred feet on the S. W. part of the rock near the entrance of the bay.

FUNGUS HÆMATODES, (from *fungus*, a mushroom, and αἱματώδης, bloody;) a term proposed by Mr. Hey, of Leeds, in his work entitled "Practical Observations in Surgery," published in 1803, to distinguish the particular form of disease now about to be discussed, from cancer, an appellation under which writers, both ancient and modern, until the commencement of the present century, seem to have included every variety of ulcerative tumour which proved untractable in progress and malignant in nature. Unhappily these are features too characteristic of fungus hæmatodes to have eluded the general denomination; but the peculiarity of appearances thus designated must in all ages have attracted notice, and in the records of various writers it is impossible not to perceive that examples of what we now call fungus hæmatodes have been regarded as extraordinary cases of cancer, or instances of anomalous disease.

At the period when Mr. Hey suggested the consideration of fungus hæmatodes as a distinct disease, it appears that the observations of Mr. John Burns, published in his valuable work on Inflammation, in 1800, were unknown to him. Mr. Burns treated of it under the title of *spongoid* inflammation. From Mr. Abernethy, in his classification of tumours, (Surgical Observations,) it has received the name of *medullary sarcoma*, since called by the French pathologists *tumeur encephaloidé*, *cerebriforme*, *carcinome sanglante*, *cancer mou*. Dr. Young has ranged it, in his system of nosology, as one of the two species of the genus carcinoma, viz. C. *spongiosum*; applying the term C. *scirrhosum* to that form of hard tumour which is characteristic of the disease commonly called cancer.

The appearances of the fungus hæmatodes, the circumstances attending its origin and progress in the human body, and the purposes of practical medicine, demand and fully justify its separate consideration. That our view, however, of the distinctive differences between it and cancer may be the more clear, we propose, in the first place, to show the analogy of the two diseases, and by which they seem to have been confounded, avoiding altogether as useless any subtle disquisition on the subject of their original identity, which the present state of pathological knowledge does not entitle us even to discuss.

They are both apt to be manifested in persons apparently of the same temperament; to be evinced by the formation of a tumour in the same regions of the body; often to be traced to similar exciting causes; and in each often to arise spontaneously; to be prone to ulceration, and afterwards to discharge matter not purulent in its nature; both often bleeding profusely: cancer, sometimes, like fungus hæmatodes, produces a fungous excrescence, and both generally alike contaminate the absorbent system: both are destructive of the neighbouring parts, of whatever nature the structure of such parts may be, and frequently affect several organs at the same time; both, also, it must be acknowledged, are most frequently untractable and destructive of life.

The history of fungus hæmatodes to the period we have mentioned of its separate consideration, must it is obvious, be involved in that of cancer; but it is impossible at the present time to trace back the observations proper to this form of disease, with such a degree of accuracy as to assist us in its elucidation. The difficulty of defining fungus hæmatodes, like that of defining many other diseases, consists in the variability of its symptoms in its progress; and, therefore, to the recorded histories of it we must refer for that information which is essential to its being well understood. The part, too, in which it is developed, the state of the constitution, and the age of the individual, are so many other causes of variety in its appearance. But the advantages of a concise definition are too obvious to deter us from hazarding such a one as we conceive to be consistent with the circumstances of the disease, and the present state of our knowledge regarding it. We characterize it then as a morbid condition of the body, evinced by the development of an elastic uneven tumour, or tumours, not painful in their early stage, and becoming so only by implication with surrounding parts; tending to ulceration, and by ulceration presenting to view a soft and spongy fungus, rapid in its growth, readily bleeding in vascular textures, and emitting a peculiar serous discharge of a very fetid odour, more or less coloured with blood.

A blow or injury of some kind is very often the immediate forerunner of this species of tumour, and the latter generally leads to the first manifestation of the disease; but in many instances its origin cannot be traced to any particular exciting cause. It is found to occur much more frequently in the young than in persons advanced in life; children from the earliest age being often its victims. The persons whom it has most generally attacked have been those of a sallow complexion, a lax and flabby texture of the skin, and a weak circulation. Observations are wanting to enable us to decide whether it is more prone to manifest itself in one sex than in the other, although the last-mentioned observations, with the recorded experience of this and cancerous diseases, are favourable to the supposition that females are more frequently the subjects of it than males. Climate, it is probable, has some influence on its production; for we are told by Sir Everard Home, in his Dissertation on Tumours, that in the Island of Otaheite, and those of its neighbourhood, where fighting is the common mode of deciding quarrels amongst the women, the blows are principally aimed at the breast, which has no defence, and that cancer has never been met with in these countries. We have good authority, too, for stating that it very rarely arises in India; and these remarks, for obvious reasons, we conceive to be equally applicable to the form of disease which is the subject of this article. That the constitution favourable to the development of fungus hæmatodes is transmitted hereditarily we cannot doubt; and that all circumstances which are of a debilitating nature have a secret influence in preparing the way for its production, we conceive may reasonably be assumed from the accumulated experience and observation of past ages on the predisposing causes of cancer. In a large majority of instances, fungus hæmatodes has terminated fatally: indeed, the recorded exceptions are so rare, and pathologists of the highest repute so agree in opinion as to its general fatality, that it may almost be questioned whether the instances which are related of its favourable issue are not to be referred to some distinctive peculiarity in the morbid change, unrecognizable in the present state of science, rather than to any favourable state of constitution or difference of treatment. The period to which life has been limited after the development of this terrible disease has rarely exceeded two years, whether its removal has been attempted by extirpation of the tumour, or every other expedient adopted consistent with the circumstances of the case and the resources of science. It generally proves fatal in a much shorter space of time, and death too often seems to have been expedited by the removal of the local disease, even to the extent of extirpation of the part, or amputation of the limb on which it may have been situated. In those cases in which the eye has been extirpated, unless a return of the disease has produced death, the growth of a similar tumour in the brain has usually been the immediate occasion of it; and when a limb, or the mamma has been removed, or even the testis, a corresponding formation in the lungs has immediately followed, and, increasing with rapid strides, has put a fatal period to the sufferings of the individual; whilst at the same time the liver most commonly, and generally several other organs and structures of the body, have been studded with similar formations.

The physical circumstances leading to the formation of these tumours are connected with a most important subject of pathological science, viz. the local and constitutional origin of disease. After premising that pathologists of the highest repute in this country have assigned to fungus hæmatodes a local origin, it is with the utmost deference we venture to assert that proofs are wanting to establish this fact, and that we consider it infinitely more consistent with acknowledged physiological principles, and the changes which we know to be produced in the elementary components of the body in this as well as in some other diseases, to assume that a morbid condition of the blood is a link in the chain of causes of fungus hæmatodes, prior to its local manifestation. We should scarcely have hazarded this opinion had we not met with sanction in the observations of Bichat and Andral; and but for the fact, admitted by those who have contended for its local origin, that the secondary formation is consequent to that change in the constitution which appears to us to be productive of the original tumour.

No one will doubt that the blood, like the other constituents of the body, is frequently altered in its nature by disease; and as it is secondary only to the chyle in the sequence of bodily formations, and is the acknowledged element of all secretions healthy and morbid, the question, we conceive, resolves itself into either the presence of the morbific matter being already in the blood, or a specific adaptation of the secreting organ to its formation. For proof of the latter we have searched in vain; but with regard to the former, we know that the qualities of the blood when this disease exists are changed; that it is much thinner than healthy blood; difficultly, if at all, coagulable; and almost wholly unequal to the process of adhesive inflammation; in fact materially deficient in the important constituent, fibrin. Andral has discovered in the blood not only different elements of secreted fluids, but, as well as other morbid productions, the peculiar one which belongs to this disease so combined with it as to alter its physical properties; occasionally limited to particular vessels, but sometimes in the greatest part of the circulatory system, when at the same time a corresponding morbid production was seen to pervade the texture of many of the solids. Similar facts, he observes, have been mentioned by Béclard and Velpeau; the former having referred to a case in which the heart and the principal trunks of the vessels were filled with a solid clot, the interior of which presented numerous collections of encephaloid matter; and the latter to a similar formation in the vena cava. He also cites the case of a man who died almost suddenly, after having shown some symptoms of cerebral congestion, and in whom, upon examination, there was found through the whole extent of the circulatory system a blood of a pultaceous consistence and blackish red colour, resembling the matter of certain abscesses of the liver. For further information on this part of our subject we refer to the interesting observations of Andral on the lesions of the blood; but we must acknowledge that there are still wanting many facts to remove all the objections which may be opposed to our views.

It is universally admitted that fungus hæmatodes is in most instances a constitutional disease before it comes under medical cognizance, and its origin is usually referred to a "peculiarity of constitution;" an observation which to us seems almost to involve the question at issue. That the local effect is, as in the case of other tumours, a morbid secretion, is undoubted. From its consistency it readily insinuates itself in the interstitial cellular substance, separating the vasa vasorum from their natural attachments, and by constantly exposing the external parietes to the action of a semifluid, they may be said to undergo a kind of maceration, and hence so to degenerate as to become unequal to the retention of their contents, or readily lacerable by the slightest local injury. Thus we consider the hemorrhagic tendency to be secondary, and superadded to the secretion itself; an opinion which we conceive to be verified by the appearance of the tumour, as seen in a state of ulceration in the mamma or extremities; as modified when it occurs in the glandular structure of the testicle; or as inspected when separated from the body and carefully washed with water.

The substance of the tumour, which from its resemblance to the brain has been called cerebriform and encephaloid, presents itself, according to the observations of Laennec, (Diction. des Sciences Médicales, Art. *Encephaloides*,) under three different forms: 1, encysted; 2. irregularly compacted without cysts; 3. infiltrated in the tissue of an organ. In whichever of these states it exists, its progress may be divided, says this eminent pathologist, into three stages; that of its formation, or the stage of crudity; that of its entire development, when it most resembles the brain; and that of its *ramollissement* or softening. It has been remarked, however, by Andral, that we have no proof that the encephaloid matter in the state of softening can only occur subsequently to the other stages; and we are disposed to believe with him that this is in many instances the state of its primary formation,—the state certainly in which it is first recognised as characteristic of the specific disease.

In its earliest stage the cerebriform tumour is lobular, moderately consistent, and appears composed of minute lobules closely compacted, marked by lines running parallel but not cooping with each other. Its colour is a dull or yellowish white. The cyst is probably secondary in formation to the enclosed substance, as traces of cyst are often found in one part and the tumour exposed in another. When completely developed, it is homogeneous, in colour milky white, occasionally tinged with red, and in consistence resembling the brain; it is greasy to the touch, and when divided soils the knife; when cut into small slices, it is semitransparent; like brain also, when exposed to the atmosphere, it softens; and when the softer parts of the tumour are washed away, or when the mass is compressed, a loose filamentous texture, resembling cellular membrane, remains. In the mass, however, as separated from the body, a number of blood-vessels are usually to be observed pervading the whole texture. Their parietes are thin and easily ruptured; and extravasated clots of blood are here and there interspersed, giving the whole, says Laennec, an appearance resembling the lesions observable in dissections of sanguineous apoplexy.

The cerebriform matter does not remain long in the state described, but proceeds rapidly to that of *ramollissement*, and, thus rendered more miscible with the extravasated blood, its colour is influenced accordingly, and is varied from a reddish white to a dark sanguineous hue. This state of softening is found to occur at different periods in the same tumour; some parts being much firmer than custard, and others, harder than the most solid parts of the healthy brain. This medullary matter is very sparingly soluble in water: if exposed to the flame of a candle in a silver spoon, it assumes the colour of opal, and it leaves after evaporation an inappreciable residue. With the addition of spirits of wine the watery solution threads slightly, without coagulating by the action of heat; this mixture evaporated, like the preceding, leaves some small grey clots. Exposed to the direct action of heat, it becomes brown, but does not liquefy like grease; and it has a smell of roasted meat. If immersed in spirits of wine, it does not undergo any apparent change. In a saturated solution of corrosive sublimate it coagulates so as to form white filament, the solution remaining transparent. Acetic acid has no visible effect upon it. Slowly boiled in water the liquid remains clear, without grease; and does not jelly when it becomes cold. (See Mémoires sur la Fongus Médullaire, par J. P. Maunoir.)

The medullary structure, though often found alone, frequently coexists with other varieties of diseased production; as fibrous or scirrhous masses, pus, scrofulous matter, melanosis, hydatids, (See Andral, vol. I. p. 219,) and in some cases ossific or earthy particles have been found intermingled with the pulpy matter. In many hæmatoid tumours there are distinctly insulated portions much resembling boiled yolk of egg; and so often has this peculiar substance been found in those organs wherein fungus hæmatodes has been detected, that the circumstance might almost be considered a characteristic of the disease.

We have stated that the earliest notice we have of fungus hæmatodes as a distinct disease has been transmitted to us by Mr. Burns, under the name of spongoid inflammation. The cases related by him, five in number, were confined to its occurrence in the extremities. Of the ten cases next published by Mr. Hey, it manifested itself in five in the extremities, in three in the female breast, in one in the lower jaw, and in another at the back of the neck. Mr. Abernethy, in his Surgical Observations published in 1804, related a case of diseased testicle, to which he gave the name of medullary sarcoma, since used by him and by many surgeons synonymously with fungus hæmatodes as it occurs in this as well as in other parts of the body, and the identity of which with the pulpy testicle described by Dr. Baillie is now universally admitted. In the best treatise we possess on this subject, published by Mr. Wardrop in 1809, and to which we are largely indebted, are collected all the scattered accounts which our literature affords relating to fungus hæmatodes prior to that period; and there we find related cases with dissections of it as it occurs in the eye, the uterus, the ovaria, the liver, the pancreas, the spleen, and the lungs. Hæmatoid tumours have since been met with, as the same writer remarks, (Preface to Baillie's Morbid Anatomy, edited by J. Wardrop, Esq.,) in the urinary bladder and alimentary canal, in the brain, in the bones, in the mesentery, in the omentum, and in the thyroid gland. Laennec states that he has seen two cases of encephaloid growth in the heart: in one the morbid matter formed several small masses in the muscular substance of the ventricles; in the other it was deposited in layers from one to four lines thick along the coronary vessels. M. Olivier, in his work on the spinal marrow, relates another case of encephaloid tumours deposited in the substance of the same organ. M. Velpeau has published a remarkable case of the same kind, in which similar tumours were also found in the lungs, between the pleura and ribs, in the bronchial glands, under the mucous membrane of the stomach, in the duodenum, in the pancreas, in the right kidney, in the liver to the amount of several hundreds, between the tunics of the gall-bladder, in the different parts of the peritoneum, in the thyroid gland under the skin, and in the muscles of the right thigh. We ourselves remember to have witnessed a case in St. George's Hospital, which proved, and on a post-mortem examination exhibited the existence of the same kind of tumours, in very considerable numbers, in all the organs of the several cavities of the body, and dispersed under the integuments of the trunk, as well as of the superior and inferior extremities. The absorbent glands, though in most instances contaminated in the early or in the advanced stages of the primary tumour, as far as we know, have never been the original seat of the disease. In some cases they grow to an enormous size, whilst in others they are but slightly enlarged. In some the primary affection makes little progress, whilst the disease of the glands advances rapidly and seems to be the immediate cause of death. Their structure is generally converted into a substance resembling the primary tumour, exhibiting a homogeneous pulpy mass contained in one firm cellular capsule; in this respect differing from the primary tumour, which is usually lobulated and intersected by cellular strata. In some cases the skin covering the gland ulcerates, and forms a foul sloughy ulcer, but rarely, if ever, produces a fungus. (See Mr. Wardrop's Essay.)

The indiscriminate manner in which cancer and fungus hæmatodes have been usually regarded, renders it necessary that their diagnostic symptoms should be particularly attended to; we shall now proceed to an exposition of these in their general character, reserving for after-consideration their local peculiarities.

The fungoid tumour before ulceration is soft and elastic, giving in most cases a more or less obscure sense of fluctuation. It does not always occasion pain; and when it does, it is of a throbbing, and not lancinating kind. It exists very rarely beyond two years without going through all its stages, and occurs most frequently in persons who have not reached the middle period of life; very often in childhood and from the earliest infancy.

Immediately after ulceration has taken place a soft spongy fungus appears, and grows rapidly, emitting a discharge like serum, which immediately mixes with the blood, always to a certain extent at the same time extravasated. The appearances of the fungus hæmatodes when taken from the body having been already discussed, we need only suggest a comparison between its properties and those of a cancerous tumour. The cancerous, or, as commonly called, scirrhous tumour, is hard, firm, and incompressible, and in its formation and progress is always attended with lancinating pains; the integuments above the tumour are usually corrugated, and exhibit on their surface several short white lines, which are in reality so many germs of the disease. In many instances scirrhus is slow in going on to ulceration; it often continues for many years, or until the termination of life, without it. It occurs generally in persons advanced beyond the middle period of life, and is scarcely ever known to take place before the age of twenty-five. In its ulcerated state its hard firm substance is transformed into a thin ichor; and, generally, the tumour does not increase in bulk, but is destroyed by the process; or if a fungus succeeds, it is hard and firm in its texture. The scirrhous tumour, when separated from the body, is hard, firm, and incompressible, and is composed of two substances, one indurated and fibrous, the other soft and inorganic. The fibrous matter is the most abundant, consisting of septa, which are paler than the soft substance between them. The latter is semi-transparent, of a bluish colour, resembling in consistence softened glue, but occasionally more opaque, softer, and somewhat oleaginous. The fibrous matter is more or less condensed and radiated, the interstices being filled with the softer substance; and sometimes the whole tumour, or parts of it, are converted into a substance resembling cartilage, which is occasionally the nidus of bony depositions.

Scrofulous tumours bear a much nearer resemblance to those of fungus hæmatodes previous to ulceration than the preceding. Their locality is often the same, though the lymphatic glands are most frequently the seat of the primary tumour in scrofula,—an occurrence which is rarely, if ever, found in fungus hæmatodes. As the tumour of the former approaches to ulceration, the integuments assume a red, but never the livid colour of the latter, and when pressed are considerably less elastic; they are frequently also found in clusters, which never is the case in fungus hæmatodes. The sallow, almost greenish cast, in the complexion of the sufferer from fungus hæmatodes, and the smooth and fair skin of the scrofulous individual, will materially assist in determining the two diseases. After ulceration has taken place, all difficulty is at an end; the bloody fungus, and peculiar fetid discharge of the one, compared with the flaky pus-like matter of the other, with the whole character of the ulcers, and their progress, render it unnecessary to dwell on the distinctive peculiarities of the two diseases. When the brain, or viscera of the cavities belonging to the trunk of the body, become the primary seats of the fungus hæmatodes tumour, the indications of its existence are necessarily very obscure. In its early stage, either when external or internal, the tumour is often wholly unirritant; and the presence of formidable disease is suspected only from the unhealthy aspect of the countenance, produced by the peculiar sallow complexion of the skin. The tumour, as it increases, will of course produce all the mechanical effects of a foreign body, in whatever part it may be situated; and the influence of disease will be more and more manifested throughout the system. Increasing debility, and at length hectic fever, are the prominent constitutional effects which we are called upon to combat; but experience shows that we have yet to learn the means of staying, even for a little time, their rapid progress to a fatal termination.

When there is already evidence of the existence of fungus hæmatodes by its appearance in an external part, and symptoms of disease in an internal organ arise, we cannot fail in deciding its nature. Of those organs which have no outlet, the liver is the only one in which we can by external examination ascertain its presence. Dr. Baillie, however, states that he has only known it as a secondary formation in this organ, and Mr. Wardrop's observations are to the same effect; but the latter writer suggests that the soft brown tubercles of the liver, described by Dr. Baillie, are probably of this nature, though they are merely noticed as a very rare appearance of disease, without any remark as to their identity. In Dr Farre's work on the morbid anatomy of the liver, we find described a disease of this organ named by him *tubera diffusa*, the character of which bears so close a resemblance to that of fungus hæmatodes in other parts, that with due allowance for the modifying influence of the organ itself, we are inclined to consider it as the same. In this as in other organs, it has usually proved irremediable, and admits only of a palliative plan of treatment:

every attempt to cure or suspend its progress by the specific action of mercury has proved worse than useless, an observation applicable to the treatment of fungus hæmatodes wherever may be its locality; for it tends only to expedite the exhaustion of those powers which are rapidly failing in defiance of all the means which art can yet summon to their support.

To complete the view of fungus hæmatodes, considered as a disease generally, we ought now to give an account of it as it affects the various internal and external parts of the body, and more particularly those in which it exhibits characteristic appearances, as the uterus and its appendages, the eye, mamma, testis, and extremities; but as nearly all these are within the domain of surgery, and come not therefore into the plan of the present work, we must here terminate what we had to say of the pathology of the disease.

Treatment. — Having had frequent occasion throughout the present article to advert to the untractable nature of the local and constitutional symptoms of the disease which is its subject, it might, on a superficial view, appear superfluous to make any further observations on its treatment. Those, however, who are in search of information to be adapted to circumstances, will be the more anxious for it in proportion to their difficulty, and it is as important in practical medicine not to make attempts inconsistent with reason and experience in incurable cases of disease, as to use the requisite means in those which are curable. It is of the utmost importance also, in our views of improvement, to know what has been done, in order that we may learn what more we can do, — or, as Andral has emphatically expressed himself on a subject yet in obscurity, and not irrelevant to the present, to keep an inventory of the facts we are in possession of, and to determine accurately where we are, in order that we may know where we are going.

It is to be kept in mind that fungus hæmatodes is a disease which, from the earliest period that it comes under professional attendance, evinces manifestations of increasing and hitherto irresistible debility; and that as a morbid poison, which it is in the strictest sense of the term, its action is progressively destructive of that organic irritability which belongs to a healthy condition of the solids. These, it must be confessed, are rather negative than positive indications to our treatment; but, for the reason suggested, they are not the less essential. Whether we regard the local or constitutional symptoms, reason as well as experience have determined that the class of remedies which constitute the antiphlogistic system is to be excluded from our plan of treatment. Locally considered, frictions, plasters, leeching, blistering, or handling this species of tumour, have been found rather to accelerate than to retard its progress. From its contiguity to particular structures, it occasionally excites an irritative heat, which the simple application of tepid water, or at most an evaporating lotion, consisting of one ounce of spirits of wine with five ounces of common distilled or rose water, is calculated to remove. The use of the lancet, or other incision with a view of evacuating its contents, under the mistaken idea of the tumour being in reality an abscess, (a mistake which has unfortunately frequently occurred,) has always tended to accelerate the progress of the disease, and is calculated to bring great opprobrium upon the operator. When ulceration takes place and the fungus appears, it is important to know that the direct application of greasy or unctuous substances seems to increase, and only when combined with an escharotic, to retard the vegetative tendency. A painful or irritable state of the fungus has occasionally been relieved by an application of three drachms of the subnitrate of bismuth, mixed with one ounce of spermacetic ointment; and in such a condition fomentations with a decoction of the heads of papaver somniferum, or the fresh leaves of the conium maculatum, may be resorted to with advantage. But for the most part we have to contend with a fungous growth which is insensible, and seems to indicate the use of direct stimulants; the strongest escharotics have therefore been applied, and in some instances without checking even its increase. Mr. Hey informs us that neither the hydrargyrus nitratus ruber, the hydrargyrus muriatus, the antimonium muriatum, nor the undiluted sulphuric acid, have been sufficient for this purpose; but as we frequently find that the upper and exterior part of the fungus is separated and falls away, by the exuberance apparently of its vegetative principle, we cannot reasonably expect much advantage from such applications, or ought to do so only in the ratio of our approximation to the base of the tumour. Our belief is, that this is placed beyond the reach of surgery, and, failing in our attempt, that such means have the effect of accelerating the fatal issue of the disease.

We have seen apparently some temporary advantage, in two instances of this affection in the female breast, from the direct application to the ulcerated surface of a paste made of carbonate of iron, with a sufficient quantity of honey to give it a soft consistence; but neither in this nor in any other commonly used applications have we any promise of a positive remedy. Whether the application of a solution of the chloride of lime may be advantageous, our experience in this affection does not enable us to determine; but from our knowledge of the relief and comfort it has produced as an injection in cancerous affections of the uterus, and as a lotion to foul ulcers, we cannot refrain, in the dearth of our resources, from suggesting its use. We anticipate no more from it than the advantage to which we are at present limited, of promoting the comfort of the sufferer; and, in his catalogue of miseries, the horrible fetor of the fungus, which it is calculated to remove, is certainly not the least distressing.

We have already sufficiently expressed ourselves on the question of excision and amputation; it remains for us only, therefore, to consider the constitutional treatment. We have searched in vain for authority to assist us in this part of our subject, and cannot but feel daunted in offering our own suggestions when one of the most experienced surgeons of the present day, Sir Astley Cooper, (see Lectures,) has thus expressed himself: "We may sometimes prevent the disposition to the formation of this disease by giving alterative medicines; but no medicine with which we are acquainted has any power over it when it is once formed." So far as it is connected with the even less fatal disease, cancer, which, though mostly incurable, has its hundred remedies, we may fairly take the sanction of the remark, "tædet et pudet garrire de remediis specificis." We have still, in the exercise of our profession, to do the best that circumstances may allow; and it is to be remembered that we are as much the guide, and our duty is as important in the difficult and dangerous path, as in that which is plain and easy. The indications we possess would lead us to advise the use of a diet nutritious, calculated to increase the fibrinous quality of the blood, and at the same time easy of digestion; the powers of the stomach being alike enfeebled with those of the other organs of the body. We should also recommend free communication with the external air, and gentle exercise, as long as they can conveniently be borne; the occasional use of medicine calculated to keep up the natural action of the alvine canal without exhausting the bodily powers, and such tonics as we have found in this and diseases most nearly allied to it to preserve the patient longest, and with least tendency to disturbance of the alimentary functions. Amongst these we would especially specify sarsaparilla, quinine, and minute doses of the muriated tincture, or other mild preparations of iron. Rest and ease from pain must be procured by suitable narcotics, and even when the fatal hectic arrives, we have yet our duty to perform. It is that which is emphatically enjoined in the humane and affecting language of the illustrious Gregory, applicable to every part of our melancholy task in this disease: "Et profecto in omnibus morbis quum jam ad extrema ventum est, et instantis mortis indicia spem nullam sanationis relinquunt, aliquid adhuc solerti medico faciendum superest: erit enim quoddam in tali miserrimo et desperato statu, lenire mala quæ summovere nequeat, et *εὐθανασίαν* saltem moribundo moliri, siquidem vitam ejus neque conservare possit, neque amplius producere."

W. Kerr.

GALL-STONE.—See Jaundice, [and Calculi (Biliary)].

GALVANISM. In 1797, Lewis Galvani, professor of anatomy in the University of Bologna, laid, by an accidental observation, the foundation of by much the most interesting and important branch of electrical science. Having suspended some frogs, which he had procured for physiological purposes, by copper hooks to the palisades of his garden, he remarked with surprise, that whenever by the impetus of the wind they were brought in contact with the iron bars of which the palisades were composed, their muscular systems were strongly convulsed. The fame of this extraordinary experiment rapidly spread throughout the entire of Europe. It was repeated and varied in an infinite number of ways, in the cabinet of the philosopher and the theatre of the mountebank, and never failed to excite the curiosity of the learned and the astonishment of the vulgar.*

Galvani was fortunate in the time of announcing his discovery. It was an era of mighty changes and of great reforms. In the very capital of continental science, the human mind, just freed from the fetters which long had bound it, became the slave of prejudices by no means unnatural. What was old was rejected, frequently because of its antiquity alone; while every novelty came recommended by irresistible attractions. There was also another and a very different cause to which may, at least in part, be attributed the interest excited by the observation of the Italian philosopher. To many it appeared that a clue was now at length afforded for ascending to the long-sought-for source from which spring the mysterious phenomena of life and organization; and that, in particular, by prosecuting the route thus pointed out, the nature and cause of nervous energy could not fail of being unfolded.

Galvani was not slow in framing an hypothesis to account for the phenomenon which he had been the first to observe. According to him, a peculiar fluid existed in the nerves of the animal in a state of accumulation, which, rushing through the interposed metals, was precipitated upon the muscles, and produced their spasmodic action. Upon this theory the animal body is but a sort of charged Leyden jar: the nerves representing its internal, and the muscles its external coating; the discharge also being effected in the ordinary manner, namely, by establishing a connection between the oppositely affected surfaces. This analogy was suggested at a very early period, and was for a length of time considered as conferring a high degree of probability on the views from which it originated.

Though this explanation was very generally acceded to, philosophers were by no means agreed respecting the nature of the fluid whose agency it employed. By some it was denominated nervous fluid, under the idea, no doubt, that it was identical with that power on which the functions of the nervous system depend, and this is the opinion which would seem to have been entertained by Galvani himself. His followers, however, usually spoke of the *galvanic* fluid in honour of their master, and to commemorate his discovery.

A different, and, as we shall see, a more correct opinion, soon began to prevail. It was very early observed that the same substances which are conductors or non-conductors of the electric, are also conductors and non-conductors of the galvanic fluid. Hence it was by many inferred that the two were identical; a conclusion, however, firmly resisted by the adherents of Galvani, who still continued to view in his experiment the operation of a vital force.

It was at this period that Volta, professor of physics in the University of Pavia, after a diligent study of the phenomena which at the time engrossed so much of the attention of the scientific world, was led to the discovery of a condition essential to its occurrence, which had escaped all of his predecessors. If the nerves and muscles be connected by a single metal, there are no convulsions; but if by an arc composed of two dissimilar metals, convulsive motions always ensue. Having established this important point, it still remained for him to account for the agency of the two metals, or to explain the precise manner in which they determined the production of the spasms. This he accomplished in the most satisfactory manner, by showing experimentally that dissimilar metals upon contact assume opposite electrical states; or that the one becomes vitreously, the other resinously charged. Having effected this, the true theory of Galvani's experiment was sufficiently obvious. By the contact of the copper hook with the iron palisades, the latter became vitreously, and the former resinously electric. But when the limbs of the frog touched the iron bars, the free fluids rushed together by the route thus opened to them, and combining in the body of the animal, produced the spasmodic contractions of its muscular system. Such was the explanation given by Volta.

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* This experiment is best performed by removing the upper part of the trunk of the animal, drawing off the skin from the inferior portion of the trunk and lower extremities, and cutting away the bones of the pelvis and contiguous soft parts; so that the lumbar vertebræ may remain connected to the thighs by the crural nerves alone. A copper hook is now to be attached to the vertebræ, or made to embrace the nerves, and then hung on a rectangle composed of iron wire, which, by being inclined, is made to come into contact with the penden limbs.

These views, which appeared but a legitimate deduction from facts, though generally received elsewhere, were not admitted by Galvani. He denied the necessity of a second metal, and quoted indisputable cases of convulsions excited by a single arc, as a refutation of the entire theory.

That contractions are occasionally produced by a single metal, Volta did not deny. More extended researches, however, upon the electricity developed by contact, enabled him to reconcile such cases with his own views. He found, in fact, that the metals were not the only forms of matter which, when made to touch, acquired the opposite electricities; but that this property belonged to any two heterogeneous substances. Thus, if a disc of wood be made to touch one of marble, an electric decomposition ensues; and the only difference between this case and that of two dissimilar metals is, that the electricities developed possess a much lower intensity. Now, adopting these conclusions, it is easy to solve the objection of Galvani. The metal employed by him may have possibly included a minute quantity of some other metal in the form of alloy; or such may have adhered mechanically to it. Or, should neither of these suppositions be correct, it must at all events, when interposed between the nerves and muscles, have touched, at each extremity, substances of a very different nature from its own; a circumstance which, according to the researches of Volta, was quite sufficient to account for the development of electricity. The facts, therefore, relied upon by Galvani were not only not inconsistent with, but directly deducible from the principles of Volta. It may also be observed, that by means of a single metal we but rarely succeed in producing contractions; and that, when they occur, they are extremely feeble.

When two dissimilar metals are made to touch, the one becomes positive and the other negative. This was the capital discovery of Volta. The power which produces, in such cases, the electric decompositions, he denominated *electromotive force*, and the substances employed, *electromotors* All metals, however, it should be recollected, are not equally good electromotors. Thus zinc forms a more efficacious combination with silver than with copper; and a still more powerful one with platina than with silver. As a general rule it may be laid down, that the more two metals differ as to their affinities for oxygen, the more energetically will they act as motors of electricity; to which may be added, that the more oxidable metal invariably acquires the vitreous or positive, and the less oxidable metal the resinous or negative fluid. Such are the uniform results of experiment.

The tension of the fluids liberated by the contact of a single pair of metals, when examined by the most delicate condenser, proves to be extremely feeble; and it even requires considerable address to demonstrate, with this instrument, the development of any electricity at all; though, by means of the frog, the most sensible of all electroscopes, it may, as we have seen, be strikingly displayed. In reflecting, however, upon his fundamental discovery of the development of electricity by heterogeneous contact, it occurred to Volta that by properly connecting several *couples*, their separate powers might be so combined as to evolve the elementary electric fluids in a high state of tension; and, upon submitting this conception to the test of experiment, he had the satisfaction of finding it fully verified. The following was his method of proceeding. A disc of silver being placed upon a table, one of zinc was laid upon it; and upon this a bit of thin pasteboard soaked with a solution of common salt. Another silver disc was put upon the pasteboard; upon it a disc of zinc, and upon this again a second bit of pasteboard, and so on; similar discs of silver, zinc, and pasteboard being constantly piled upon the preceding, and in the order which has been described. Having superimposed in this manner thirty or forty couples with their intervening pasteboards, upon applying a finger of each hand to the extremities of the column, he received a pretty smart shock, and upon connecting them by copper wires he observed the production of a slight spark. Such was the origin of the celebrated pile of Volta.

The instrument just described is usually known under the name of the columnar pile. Several modifications of it have from time to time been invented. But it will be sufficient, with a view to the present article, to confine ourselves to a description of the *voltaic trough*, this being the form of galvanic machine most generally employed, particularly for medical and physiological purposes. It originated with Mr. Cruikshank, and may be constructed as follows. A number of equal plates of zinc and copper, of a square or rectangular shape, are procured; and each plate of zinc being soldered by one of its faces to a plate of copper, the compound plates are then cemented into a rectangular cistern of wood, at distances from each other of about half an inch, care being taken that the contiguous couples shall always present to each other dissimilar faces—zinc, for example, to copper. The cistern, whose breadth is the same with that of each couple, is thus divided into cells; and when the machine is to be rendered active, these are to be filled to within a short distance of the top with an acid solution.

On the contrary, when the trough is not in use it is to be emptied of its acid, and well washed with water to prevent any unnecessary corrosion of the metals. This machine does evidently not differ, in any essential particular, from the original invention of Volta. They are both composed of dissimilar metallic electromotors, similarly arranged in reference to each other, the only differences being, that in the pile they have a vertical, in the trough a horizontal position, and that in the former the couples are separated by a disc of cloth or pasteboard moistened with an acid, while in the latter they are separated by strata of the acid solution itself.

We may now proceed to an examination of the phenomena exhibited by the voltaic apparatus, and of the singular powers which it is capable of exerting. These may be conveniently studied under the four following circumstances: 1. when the circuit is incomplete, that is, when the opposite extremities of the pile are not connected by a conductor of electricity: 2. when the interposed medium is an imperfect conductor, such as water, the acid, alkaline, and saline solutions: 3. when it is a good conductor, as charcoal or the metals: 4. when the circuit is completed through a living animal. Upon the three first heads, which comprehend the science of galvanism, as it is related to chemistry and general physics, our observations shall be very brief; but upon the fourth we shall dwell with more minuteness, as it includes topics the discussion of which must prove interesting to the physician and physiologist.

If the upper end of a columnar pile, whose lower end is in connection with the ground, be examined by appropriate means, it will be found to be electrically excited. The pile being supposed to consist of zinc and copper discs, when the former is uppermost the electricity is positive, and negative when the latter crowns the column. The tension also of the electricity is directly proportional to the number of couples; so that in three piles consisting of twenty, forty, and sixty couples respectively, the tensions are as the numbers one, two, three. The lower extremity of the pile, or that which communicates with the ground, manifests, of course, no symptoms of excitement. If the pile be insulated, by building it upon a plate of glass or resin, or suspending it in a dry atmosphere by a silken cord, both extremities will be found charged; the zinc end with positive, and the copper end with negative electricity, while its central point maintains the neutral state. In receding from the centre also on either side, the electric tension, which is at first feeble, goes on augmenting until it attains its maximum at both ends, which are from thence denominated the poles of the pile, from their analogy to the extremities of a bar magnet. It is almost unnecessary to observe that these statements are equally true of the trough, or any other form of voltaic machine. Upon the principles of Volta, also, which we have all along adopted, it would be easy to assign the theory of the accumulation of the elementary electricities at the opposite poles. But from this discussion we purposely abstain, as being one which is destitute of any immediate practical bearing.

Before observing upon the effects produced by the voltaic machine when its poles are connected by conductors, it will be proper to form clear notions upon what is usually denominated the *direction* of the electric current. Upon the theory of Dufay, (see Electricity,) it is obvious that the two kinds of electricity are set in motion at the same instant, and that a current of positive electricity in one direction bespeaks a current of negative electricity in the opposite direction. It is sufficient, however, to confine our attention to one of the elementary fluids, the direction of one determining the course of both; and that pitched upon by common consent is the positive. Whenever, therefore, mention is made of the direction of the electric current, it must be understood that we speak of the positive or vitreous electricity.

Thus in the pile itself the electric fluid is said to move from the copper to the zinc end; while through the conducting medium supposed to connect the poles, its route is alleged to be from the zinc to the copper. This statement is strictly true of the positive or vitreous fluid, and we limit ourselves to the description of its course alone, for the sake of brevity.

In all machines consisting of more than one pair of electromotors the direction of the current is obviously what has been just described; that is, it sets, in the pile itself from the copper to the zinc end, and, in the arc which completes the circuit, from the zinc to the copper. But in an elementary pile, or one including but a single pair of metals separated by an acid or saline solution, the direction of the current through a wire supposed to connect the plates is from the copper to the zinc, or apparently in an opposite direction to that just described. This, however, is really not the case, as will be obvious upon reflecting that the connecting wire is a part of the copper element of the combination, while the fluid is merely the conductor interposed between the poles. Though, in fact, in this simplest form of voltaic combination the current moves from the copper to the zinc through the wire, and from the zinc to the copper through the fluid, its direction is the same as in a pile of several couples; for the wire is a part of the pile itself, and the fluid the medium which completes the circuit.

When the circuit is completed through imperfect conductors of a compound nature, they undergo decomposition, some of the elements appearing at the positive, others at the negative pole. This fact was first noticed by Carlisle and Nicholson in the case of water, and the researches of other chemists, particularly those of Berzelius and Davy, have shown that it holds in every variety of compound substance when subjected to the action of a battery of sufficient power.

When the wires usually attached to the poles of a battery for completing the circuit are armed with cones of charcoal, and then approached to each other, heat and light of the most intense description are immediately developed, and the phenomena are equally brilliant in vacuo as in atmospherical air. If the circuit be completed through a fine wire, it immediately undergoes vivid ignition, and finally melts, even though it be composed of platina. And if for wire the different metallic foils be substituted, they burn with scintillations of the most brilliant description.

In more modern times other very singular phenomena have been observed upon passing a galvanic current through a wire, or other conductor, placed in the vicinity of a magnetic needle. When the wire is parallel to and immediately over the needle, a current, whose direction is from south to north, causes a deviation to the left hand, or the west. If the wire, its parallelism to the needle being always preserved, be placed just under it, a deviation eastward, or to the right hand, is produced. If the dipping-needle be now substituted for the compass, and the conducting wire be placed to its west, a depression of the north pole immediately ensues; if to the east, the same extremity is elevated.

These constitute the great discoveries of Œrsted, which have given rise to the science of electro-magnetism, and promise, at no distant period, to rectify and generalise, to an extent which could not be previously anticipated, our notions respecting some of the most important of the powers of nature. This brief notice of them is introduced here chiefly for the purpose of rendering intelligible the nature of the galvanometer, an instrument which we shall have occasion hereafter to refer to, and of which it is a sufficient description to say, that it indicates the force of electrical currents by the deviations which they produce in a horizontal magnetic needle, around and in the vicinity of which they are made to circulate through a wire situate in a vertical plane passing through its two poles.

Having glanced thus rapidly at the origin of the science of galvanism, the discoveries of Volta, and the application of his machine as an agent of analysis, and for the production of calorific and electro-magnetic effects, we may now proceed to the more immediate object of this article, namely, the examination of the influence of the pile upon the living system, and the exposition of its therapeutic agencies. The two latter subjects are obviously intimately connected, and should, therefore, be studied in conjunction.

The galvanic current, when brought to act upon the living body, is capable of producing three orders of effects. 1. It produces peculiar sensations. 2. It determines muscular contractions. 3. It is supposed to influence the organs of secretion. Upon these we shall observe in succession.

If a slip of zinc, applied to the tip of the tongue, and a dollar, placed between the gum and upper lip, be brought into contact, a decidedly acid taste is experienced; but if the position of the metals be reversed, the taste will be a decidedly alkaline one. In order to the production of these sensations, the tongue must be covered with some moisture, for, when perfectly dry, no such impressions are perceived. Hence it is probable that such sensations are owing, not to any direct action of galvanism upon the tongue, but to the decomposition of the salts of the saliva, and to the consequent development of an acid and an alkali at the opposite poles. Berzelius first noticed similar effects from streams of common electricity directed by a painted wire upon the tongue, or that the vitreous fluid produced an acid, and the resinous fluid an alkaline taste.

When the experiment, just described, with the slips of zinc and silver, is performed in the dark, a flash of light is perceived, which is observable not only upon bringing the metals into contact, but also upon separating them from each other; and it is worthy of remark, that the flash is most vivid when the zinc or positive metal is in contact with the tongue. A more decided effect may be produced by attaching to the eye-ball, beneath the eye-lid, a slip of tin foil, placing a silver spoon in the mouth, and connecting it and the foil by any metallic ore. The experiment succeeds also in the light, and whether the eye be open or shut; and at the instant of the contact of the metals the pupil is observed to diminish in size, just as when the eye from comparative darkness is suddenly exposed to the glare of sunshine. The luminous coruscations observable in these experiments are probably the result of the mechanical action of the galvanic fluid upon the retina, for phenomena of precisely the same description may, as is well known, be produced by inflicting a slight blow upon the eye-ball.

Upon the pain produced by galvanism it is unnecessary to dwell. It is an invariable accompaniment of the sudden transmission through, or withdrawal from the body, of a strong electric current. During the completion of the circuit also, a disagreeable sensation is experienced, which becomes extremely distressing if the part of the body at which the current enters, or from which it issues, be deprived of its cuticle, or if there be a sore or cut in the line of its passage. Even pain may be produced by a very feeble current, as is well illustrated by an experiment easily repeated, in which a leech is securely imprisoned by merely placing it upon a crown-piece resting upon a sheet of zinc. From experiments on frogs, M. Morianini infers that the influence of the galvanic fluid on the animal economy is different according as it moves in the course of the ramification of the nerves, or in the opposite direction. In the former case, according to him, it determines convulsive motions alone; in the latter, sensations. These conclusions, however, have been overturned by the recent researches of Nobili, of which we shall presently have to make more particular mention.

When any part of an animal, either still living or but recently dead, is made a part of the galvanic circuit, a shock is experienced closely resembling that caused by the discharge of a Leyden phial, and the intervening muscles are thrown into momentary convulsive action. Thus if, while the negative pole is touched by the fingers of one hand, the other be brought into contact with the positive end of a voltaic machine, a concussion will be felt in both hands, which will extend to the wrists, the elbow, or even the chest, according to the intensity of the developed electricities. Nor are the pile or any of its modifications essential to the production of such phenomena. In the frog they may be produced, as in the experiments of Galvani, by a single pair of electromotors; and the same is true of the earth-worm, the leech, the nais, and many other cold-blooded animals. The frog, however, is, of all known organized beings, that which is most easily excited by the galvanic stimulus; and hence, and because, generally speaking, it may be procured without difficulty, it has been usually made the subject of such experiments.

The first point of importance to be noticed in reference to the influence of galvanism on the muscular system is, that a shock is felt, and convulsions are produced, not only when the circuit is completed, but also at the moment when it is broken, and that during the maintenance of the circuit no such effect is perceived. Thus, if a slip of zinc be laid upon the crural nerves of a frog, prepared as described in the note at the commencement of this article, and a copper wire upon either of the lower limbs, when brought into contact, the extremities are convulsed; during the contact, there is no contraction, but upon separating the metals from each other, or one or both from the animal, so as to interrupt the circuit, the spasm is renewed. In order, however, to the experimental verification of these phenomena, it is necessary that the circuit be completed or interrupted with rapidity; for if the electric current be gradually admitted into or withdrawn from the body of an animal, no spasms will ensue. This fact is interesting, and is well illustrated by the following ingenious experiment made by Mr. Morianini. (Annal. de Chimie, xl.) Let a prepared frog be placed between the terminal cups of a couronne de tasses composed of a few couples, and which is interrupted at some one point, a single pair of the electromotors being wanting. Upon supplying the place of this couple by two fingers of the same hand, both being perfectly dry, no effect will be produced upon the frog. But if the fingers be kept for a few instants in the cups, upon withdrawing them contractions will take place. When first immersed, the cuticle being quite dry, and in such state a non-conductor, the circuit is in fact not immediately completed. This, however, is effected gradually in proportion as the epidermis becomes soaked with moisture, and hence, upon removing the fingers and thus suddenly interrupting the current, the frog is convulsed. The fluid of the cups in which the fingers are immersed should be pure water.

Having determined the chief conditions necessary to the production, by the pile or one of its elementary couples, of involuntary muscular contractions, we have next to consider whether such effects are at all influenced by the direction which the current takes through the body, or by the nature of the particular tissue which it traverses. The latter topic shall be first discussed.

The muscles of the animal body may, it is well known, be divided into three classes,—the voluntary, the involuntary, and those of a mixed character. The muscles, for example, which move the extremities are of the first kind. The heart is an involuntary muscle, and the diaphragm, though chiefly involuntary, as performing, under ordinary circumstances, its movements independently of the will, is also partly voluntary, inasmuch as these movements may for a time be suspended.

Now upon all three the galvanic fluid exercises a similar power, that is, it stimulates them to convulsive action. The involuntary muscles are undoubtedly much less affected by it than those which are under the control of the will; and it has even been contended by some that they were entirely exempt from its influence; an opinion, however, amply refuted by the experiments of Fowler, Nysten, Humboldt, and other eminent physiologists. We shall nevertheless confine our remarks to the voluntary muscles. They constitute the most numerous class, and are, as has been just observed, much more sensible than the others to the voltaic stimulus.

If the nervous chord whose ramifications supply a muscle be cut, the muscle is paralysed, or will no longer contract at the suggestion of the will. This is well known to every physiologist. A similar result also would be obtained by exercising pressure upon the part of the brain or spinal cord from which the nerve originates. From these facts, therefore, which establish that the power of the will in determining the contraction of a muscle is exercised through the nerve which is distributed to it, it would seem a probable inference that the spasms caused by galvanic combinations are also dependent upon some influence propagated through the same channel. Now the conclusion to which we are thus led by analogical considerations seems demonstrated by the following experiment.

Let a frog, prepared as has been already described, be placed upon a common plate, with its crural nerves hooked upon a copper wire, and a slip of zinc laid upon one of its limbs. Upon bringing the metals into contact, convulsions will ensue; but if the copper wire be disengaged from the nerves, and made to touch the muscles of the pelvis, or upper part of one of the thighs, upon effecting the contact of the metals as before, there will be either no convulsion, or one of a very feeble description.

If spasms were uniformly wanting in the latter part of the experiment, the conclusion would seem irresistible, that the stimulus of electricity, in order to be efficacious in determining contractions, should be conveyed to the muscles through the medium of the nerves. Their occasional occurrence, however, cannot be considered as fatal to such an inference; for the current, in penetrating the muscles, will necessarily meet with nervous fibrils, so that the slight contractions, which are occasionally observed, may be attributed to its motion along these. Consistently also with this solution it may be observed, that the experiment succeeds best with electromotors of low power, as copper and platina. With zinc and copper the electricity evolved may be conceived to possess such tension as to enable it to dip into the muscles, and thus pursue its route along the nerves which it there encounters. That the muscular fibre, therefore, is passive under the direct influence of the electric current, and that the spasmodic contractions which it suffers, in ordinary galvanic experiments, are the result of some modification of state produced by galvanism in the nerves which supply it, has not only analogy in its favour, but is supported by direct experiment. It is also the conclusion to which M. Nobili (Annal. de Chimie, xlv. page 60) has come, after an elaborate analysis of the various facts and reasonings that admit of being brought to bear upon the subject.

When, then, the galvanic influence is suddenly transmitted through a nerve, or suddenly withdrawn from it, the muscles to which this nerve is distributed are convulsed, but are not at all affected by the immediate action of the electric current. Is this effect independent of the direction of the cur rent? or is it influenced by it? Such are the questions which we have now to examine, and, if possible, resolve.

There are many experiments upon record, most of which may easily be repeated, demonstrating that the electric current produces the most striking effects when passed along a nerve in the direction of its ramifications, or from its origin to its distribution. Thus Volta found that a prepared frog was convulsed by the discharge of a Leyden phial when the nerves were directed to the positive surface, but not when they were presented to the negative coating. Dr. Ure, also, has noticed a similar fact, and illustrated it by the following well known experiment. Let a prepared frog be held by its crural nerves in the left hand, while one of its legs is at the same time laid hold of by an assistant. A bit of silver held in the other hand is now made to touch a slip of zinc in the second hand of the assistant; and, upon contact, there will be either no convulsions, or they will be very feeble. Let the experimenter and his assistant now exchange metals, and, upon repeating the contact, very vivid convulsions will take place. Here, in the case where the spasms are decided, the electricity obviously moves from the nerves to the muscles, or in the direction in which they ramify, the zinc being the positive metal.

The preceding is but a modification of the celebrated experiment of Mr. Lehot. To the crural nerves of a prepared frog he attached a slip of zinc, and, holding one of its legs in his left hand, he brought the zinc in contact with a surface of mercury, and found that, upon touching the same surface with his right hand, so as to close the circuit, convulsions ensued. Upon, however, disengaging the zinc from the nerves, and bringing both into contact with the mercury, a leg of the frog being held, as before, in one hand, and the zinc plates in the other, no contractions were observed. The same phenomena also presented themselves upon using a couple composed of any two of the following substances: zinc, lead, tin, mercury, bismuth, copper, silver, and plumbago. The conclusions arrived at by Lehot by means of single couples, were subsequently drawn by Bellingieri, who operated with piles. The experiment succeeds perfectly with a combination of a few couples. But when the pile is powerful, there is a convulsion, in whatever direction the current be made to traverse the nerve. It is, however, always much feebler in the case of the inverse than of the direct route, and may probably be accounted for by a few recurrent fibrils conducting some of the electric fluid to the muscles to which they are distributed. On the whole, then, though it would probably be premature to infer, from what precedes, that inverse currents are incapable of producing muscular spasms, it certainly appears sufficiently proved that they are much less adapted than direct ones for the production of such effect.

The most curious fact connected with this interesting subject still remains to be mentioned. To produce the convulsions of a muscle by galvanism, it is not necessary that the electric current should extend to it, or, in other words, that it should be comprehended in the circuit. It is quite sufficient that the latter be completed through ever so small a portion of the nervous trunk which supplies the muscle. By operating in this way both with direct and inverse currents, and noting the phenomena which presented themselves, both upon closing and upon opening the circuit, M. Nobili arrived at the results included in the following table. In order to their being perfectly understood, it should be premised that the experiments were performed at four consecutive periods, separated from each other by equal intervals, and that the excitability of the animal was, as will be readily anticipated, constantly diminishing.

FIRST PERIOD.

Direct Current.	*Inverse Current,*
Closing, Contractions.	Closing, Contractions.
Opening, ditto.	Opening, ditto.

SECOND PERIOD.

Direct Current.	*Inverse Current.*
Closing, Strong contractions.	Closing, No contractions.
Opening, Feeble ditto.	Opening, Strong ditto.

THIRD PERIOD.

Direct Current.	*Inverse Current.*
Closing, Strong contractions.	Closing, None.
Opening, None.	Opening, Strong.

FOURTH PERIOD.

Direct Current.	*Inverse Current.*
Closing, contractions.	Closing, None.
Opening, None.	Opening, None.

Such were the results almost uniformly obtained by Nobili. Exceptions, however, occasionally occurred, but these were almost always observed in the case of frogs in a feeble or exhausted state from want of food, or long confinement. It is fit also to state that his experiments were made in autumn, at a temperature varying between 50° and 59° Fahrenheit, and with a single pair of feeble electromotors, as copper and platina. With piles, or even a more powerful couple, as zinc and silver, the above order of effects is not exactly observed. The difference, however, is not material, it consisting merely in this, that the last contraction which disappears is that consequent, not upon establishing the direct, but upon interrupting the inverse current.

The order of effects represented in the table, and what he denominates the law of the contractions, Nobili found to continue the same, whether the circuit be completed through an insulated portion of nerve, or, as in ordinary experiments, through the nerves and muscles; a circumstance from which he does not fail to deduce another argument in favour of the conclusion which we have already drawn, namely, that the muscles are stimulated to contraction by the electric current only when it operates through the medium of the nerves. The argument is undoubtedly a strong one, and, when combined with those already advanced, may, we think, be considered as deciding the question.

From the entire of the preceding facts the following conclusions may be deduced.

1. The muscular fibre is insensible to the stimulus of galvanism when applied directly to it.

2. When an electric current is suddenly transmitted through a nerve to a muscle, or in the inverse direction, the muscle is thrown into spasmodic action.

3. The same effect is produced upon suddenly

interrupting the electric current when moving in either of the directions just described.

4. Precisely similar results to those mentioned in the two preceding paragraphs are obtained upon completing the circuit through a portion of the nervous trunk which is distributed to a muscle, and upon interrupting it after being so completed.

5. The most powerful contractions are produced by transmitting the direct current.

6. The next, in point of energy, are those which occur upon interrupting the inverse current.

[It is not necessary, in these galvanic experiments, to expose the nerve. The writer, as remarked elsewhere, (*Human Physiology*, 5th edit. ii. 368, Philad. 1844,) has long known, that, in the case of the frog, this is needless; and, in his experiments, he has been in the habit of acting under this knowledge. The experiments, made on three criminals, two of whom were executed at Philadelphia, and the third at Lancaster, Pennsylvania, showed, indeed, that the effect was even greater when the nerves were not exposed. It was found, too, to be more marked when the current was transmitted from the peripheral extremity of a nerve towards its centre. (Bell's *Journal*, Oct. 1839; *Amer. Journ. of Med. Science*, May, 1840; and *Medical Examiner*, Jan. 23 and 30th, 1841.)]

As an apt conclusion to the preceding topics we shall briefly notice here a theory of the cause of muscular contractions not long since put forward by Prevost and Dumas. (See *Edwards*, Sur les effets des agens physiques sur la Vie. Appendice.) It is founded upon two recent discoveries, the one in anatomy, the other in electro-magnetism.

By microscopical observations upon the abdominal muscles of a frog, these physiologists ascertained that, during contraction, the muscular fibres underwent no absolute shortening, but that each was thrown into a zigzag shape, in virtue of which its extremities were made to approach each other. They also found that the flexions invariably occurred at the same points of each fibre, and that a nervous twig passed through the vertex of every angle produced by the contraction, and in a direction perpendicular to the fibres. Such are the anatomical facts essential to their hypothesis.

For the electro-magnetic discovery which they make use of in their theory we are indebted to Ampère, who found that two parallel galvanic currents, moving in the same direction, attract, and in opposite directions, repel each other.

To account, upon the basis of the preceding facts, with Prevost and Dumas, for the contraction of a muscle, it is only necessary to suppose that galvanic currents are made to pass in the same direction through the nervous fibrils which supply it. These being parallel, must be the subjects of a mutual attraction, which will bring them closer to each other, and thus determine that sinuous arrangement of the muscular fibres they intersect, which is demonstrable by means of the microscope.

If this theory were a representation of facts, it has been suggested that we should be able to demonstrate the existence of the electric currents which it assumes. Accordingly, numerous experiments have been made with this object, but the results have been very discordant. Upon connecting, for example, two needles passed through a nerve, at a short distance from each other, with the cups of a galvanometer, M. Person (Journal de Physiologie, tom. x.) could observe no deflexion of the magnetic needle. Mr. Pouillet (Ibid. tom. v.) found a deviation when the needles were of iron, but none when they were composed of gold or platina, and therefore attributed the electricity which was set free in his experiments to chemical action. Lastly, Mr. David, (Journal of the Royal Institution, No. iv. page 183,) operating upon the sciatic nerve of a rabbit carefully insulated from surrounding parts, found the needle quite stationary as long as the animal was at rest, but observed a decided deviation whenever the muscles it supplied were thrown into action. The object is one of considerable difficulty, and can be prosecuted with a prospect of success by him only who combines, with manual dexterity, a competent knowledge of anatomy, chemistry, and general physics. In the present stage of the inquiry there are no sufficient data for enabling us to decide one way or the other. We do not, however, hesitate to avow our conviction, that the balance of evidence is in favour of the hypothesis which views the nerves as the media for the circulation of electrical currents through the animal body. It should be recollected that, when such are not indicated by the galvanometer, it would be unsafe to conclude, on this account alone, that they do not exist; for, in the first place, this instrument is not adapted for the detection of any but continuous currents, and, in the second, in order that we may be able to exhibit even these, according to the method of experimenting usually adopted, it is indispensable that the nerves be less perfect conductors of animal electricity than the wire of the galvanometer, —a condition which, possibly, is, in point of fact, not fulfilled.

But it will be asked, what is the origin of the electricity they convey? Whence do the galvanic currents proceed? Upon this head, it must be confessed, nothing having a demonstrative character can be adduced. It is true we may suppose the brain, with its production into the vertebral column, to constitute a sort of ever-acting electric organ, from which currents are transmitted along certain of the nerves at the suggestion of the will, and may conceive with Mr. [Sir J. W.] Herschel, (Lardner's Cyclop. Discourse on the Study of Natural Philosophy, p. 343,) that parts of it are spontaneously discharged at "regular intervals, when the tension of the electricity developed reaches a certain point," and that thus "the pulsations of the heart" and the contractions of the other involuntary muscles are produced. Such views are plausible, nay, even probable, but they do not admit of experimental proof, and must be considered as deriving their principal support from their apparent sufficiency to explain phenomena. Some, indeed, observing in the brain and spinal cord nothing analogous in point of structure to our artificial electromotors, and viewing the animal system as composed of an aggregation of tissues, all of which are conductors of electricity, find a difficulty in admitting that the elementary electric fluids can be either separated or accumulated within it. Such objectors, however, should recollect, first, that for the decomposition of the electric fluid the sole contact of dissimilar substances is sufficient, a condition amply fulfilled in the animal body; secondly, that there is both a decomposition and an accumulation effected by the pile, though composed exclusively of conductors; and, thirdly, that certain animals, such as the torpedo, gymnotus, and silurus, are undoubtedly possessed of the powers in question.

There is indeed another class of objectors to whom it is proper briefly to advert. The views here suggested, it will be allowed, tend to conclusions hostile to religion, inasmuch as they profess to explain the animal functions upon principles purely material. This is an objection which, when honestly urged, usually proceeds from weak and timid men. Our reply shall simply be, that while we recognise throughout the entire of the organized world the operation of a variety of secondary causes of a mechanical kind, we are, by the very contemplation of them, compelled to admit the existence of other agents higher in the chain of causality, and in their nature totally different from and independent of matter.

In the thirty-third volume of the Philosophical Magazine, page 488, there is a paper from the pen of Dr. Wollaston, containing the earliest conjectures to be met with in reference to the influence of galvanism upon the secerning organs. Reflecting upon the wonderful powers of decomposition and transfer which Davy had lately shown that the pile was capable of exerting, and upon the fact of a distinct electric apparatus having been detected in certain fishes, it occurred to this eminent philosopher that the products of secretion might be due to electricity of low intensity; and he even suggested the nature of the secretions, as to acidity or alkalinity, as a test of the species of electric fluid accumulated in each organ. Thus the milk, the sweat, and the urine, as being all acid, should, upon this principle, be considered as proceeding from organs in an electro-positive state; while the bile and different serous secretions, as containing a free alkali, would argue an electro-negative state of the parts from which they are discharged. In support also of his hypothesis he quotes the result of an experiment in which very feeble electricity, such as is developed by a single couple composed of zinc and silver, effected the decomposition of common salt dissolved in two hundred and forty times its weight of water, and the transfer of its alkaline base through a slip of bladder tied over the end of the glass tube in which the solution was contained. Mr. Matteucci has recently (Annales de Chimie et de Physique, March 1830, p. 256) revived the experiment and the views of Wollaston, and added the important observation that the animal principles occurring in the several secreted fluids abound in elements of corresponding electrical relations, or that in the acid, oxygen and azote, in the alkaline, carbon and hydrogen, are chiefly to be found. Dr. Wilson Philip, however, is unquestionably the individual who has espoused this theory with most zeal, and illustrated it with most success. His researches are extremely interesting in themselves, and have fixed, in an especial manner, the attention of physiologists. We shall, therefore, briefly notice them in this article, and shall commence with a description of his principal experiment.

The par vagum, or eighth pair of nerves, which are chiefly distributed to the stomach, and lungs, were divided in the necks of several rabbits, shortly after having fed upon parsley. Their respiration was thus immediately rendered laborious, nausea and fruitless attempts to vomit supervened, and the animals finally died, apparently of suffocation. Upon opening their stomachs, also, the parsley was found quite unaltered, from which he concluded that the secretion of the gastric juice had been suspended. The same experiment was then performed upon other rabbits, with this difference, that galvanic currents were sent to the stomach, by applying one of the poles of a small pile to a slip of tin foil rolled round the lower ends of the divided nerves, and the other to a disc of silver laid upon the epigastrium. In all these cases dyspnœa and tendency to vomit were wanting, and the animals being killed, after the currents had been continued for twenty-six hours, the parsley was found perfectly digested, and the stomach of each exhaled the odour peculiar to this organ during digestion. From experiments such as these, very frequently repeated, and always with the same results, Dr. Philip concludes that the secretion of the gastric juice is under the control of the nervous influence, and that this latter is identical with, because it may be replaced by, the power developed by galvanic combinations. Dr. Philip, however, does not confine himself to this inference, which, if not rigorously established, would at least appear supported by plausible arguments; but goes the extent of asserting that "galvanism is capable of performing all the functions of the nervous influence in the animal economy;" or, to abide by his own enumeration of these, that, besides "combining the elementary parts of the blood in the formation of the secreted fluids, it conveys impressions to and from the sensorium, excites the muscular system, and produces an evolution of caloric from arterial blood." His researches, it must be admitted, have not been sufficiently extended to justify so sweeping a conclusion; for, beside the experiments just detailed, and which relate to digestion alone, but one having a different scope would appear to have been performed by him. Upon passing the galvanic current through blood recently drawn from the carotid arteries of a rabbit, he states that he observed a rise of temperature of 3° Fahrenheit, or from 98° to 101°. This experiment, however, is far from being conclusive, and must, at all events, be considered as furnishing much too narrow a basis for the theory which he builds upon it, namely, that animal heat is due to currents of electricity which are ever circulating through the contents of the arterial branches of the sanguiferous system.

Nor have the conclusions of Dr. Philip, in reference to the gastric secretion, nor the alleged facts upon which he professes to found them, met with universal adoption. In 1823, (Archives Générales for August,) MM. Breschet and H. M. Edwards undertook the investigation of this contested subject, and by a number of experiments, apparently conducted with all the precautions necessary to insure accuracy of result, conceived that they had established the following propositions:—

1. The simple section of the pneumo-gastric nerves retards, but does not entirely prevent, the digestive process.

2. The excision of a portion of them almost completely suspends this function.

3. In both the preceding cases digestion is restored by the transmission of electric currents along the nerves to the stomach.

But from subsequent researches, made in conjunction with M. Vavasseur, (Archives Générales, 1825,) these physiologists were led to believe that galvanism acted merely as a stimulant upon the glands which secrete the gastric fluid, and that similar effects might be produced by anything causing a mechanical irritation of the lower ends of the divided nerves. There is also another important point on which they differ from Dr. W. Philip. The latter asserts that the section of the par vagum suspends digestion by preventing the secretion of the gastric juice, the muscular power of the stomach continuing unimpaired; while Breschet, Edwards, and Vavasseur contend that the stomach is paralyzed by the division of these nerves, and that the interruption of the digestive process is to be ascribed to the cessation of those motions in virtue of which the several parts of the alimentary bolus are brought into successive contact with the secreting surface of this organ. Were these conclusions clearly established, the theory which represents secretion as a galvanic function could scarcely be maintained. In justice, however, to Dr. Philip, it should be mentioned that Mr. Cutler, (Med. Chir. Review, vol. iii. p. 589,) operating under the direction and with the assistance of Dr. Philip himself and of Mr. Brodie, was not enabled by any means of mechanical irritation, to produce those effects which are, upon all hands, admitted to follow upon the due application of electric currents. The chief of the above objections is thus invalidated, if not overturned; so that we do not hesitate to assert, contrary to an opinion very generally expressed, that the question is still open for discussion, and has by no means been set at rest by the researches of the French physiologists.

Application of Galvanism to the Treatment of Diseases.—Having disposed of the supposed agencies of galvanism in carrying on the functions of the healthy body, we are in a better predicament for appreciating its influence as a medicinal agent. This is the only topic, legitimately within the scope of the present article, which remains to be discussed.

The first therapeutic application of the pile, of which we shall make mention, was suggested by Prevost and Dumas. (Journal de Physiologie, tom. iii. p. 217.) Reflecting upon its powers of decomposition, particularly as illustrated by the celebrated discoveries of Davy, it occurred to these physiologists that it might be successfully employed for breaking down the materials which compose urinary calculi, and that thus the necessity for one of the most formidable of surgical operations would be obviated. Their idea, in fact, was to introduce into the bladder a canula containing two platina wires, carefully insulated from each other, and whose internal ends should be brought in contact with the stone, while their external extremities were put in connection with the poles of a powerful battery. Upon the established principles of electro-chemistry they expected that it would be resolved into its acids and bases, the former assembling at the positive, the latter at the negative pole, and that, in this way, its gradual disintegration would be effected. A preliminary experiment, made upon a fusible calculus placed in a basin of water, and a second, upon a stone of the same kind, introduced into the bladder of a dog previously injected with tepid water, gave encouraging results. The former, submitted for eight hours to the action of a battery composed of one hundred and twenty couples, and charged with muriatic acid diluted with thirty times its weight of water, was reduced from ninety-two to eighty grains, and in eight additional hours, was so disintegrated as to break into small crystalline fragments, upon the application of the slightest pressure. The latter underwent similar changes, and they found that no irritating effect whatever was produced upon the bladder, however powerful the pile which they employed. This proposal, however, has, we believe, never been acted on. It is obviously not applicable at all to the lithic calculi, which constitute by much the most numerous variety. The manipulations, also, are so difficult of execution, the process is necessarily so slow, and the result so uncertain, as to leave us at no loss for conjecturing why the preference should hitherto have been invariably given to lithotomy. Nor, considering the recent admirable invention of grinding down the stone, is it likely that the value of the galvanic method will be tested upon any future occasion.

The next application of galvanism to be noticed is in the treatment of asphyxia, whether proceeding from strangulation, drowning, narcotic poisons, the inhalation of noxious gases, or simple concussion of the cerebral system. In all these cases the interrupted current, that is, a succession of shocks, should be resorted to, the battery should be pretty powerful, and care should be taken that the electricity be as much as possible confined to the nerves, and that it be sent along them in the direction of their ramifications. The experiments of Nobili and Ure, already detailed, sufficiently demonstrate the propriety of attending to these particulars. The chief object in asphyxia being to restore the circulation of the blood and the respiratory movements, the galvanic influence should be principally directed to the organs upon whose actions these depend; and towards accomplishing this, no plan appears more likely to be efficacious than that which has been recommended by Dr. Ure, and which consists in laying bare the sheath which encloses the par vagum and great sympathetic nerve, touching it with the wire connected with the positive pole of a battery, and, while one extremity of the negative wire is pressed under the cartilage of the seventh rib, drawing the other along the upper edges of the plates of the last trough, towards its copper end. In this way, a rapid succession of discharges, each succeeding one of which exceeds the preceding in intensity, is sent to the heart, the lungs, and the diaphragm, that is, to the organs whose functions we are most anxious to revive. Before attempting the operation of laying bare the nerves, the effect of merely pressing the positive wire upon the region of the neck corresponding to their position should be tried. Operating according to the former method, and with a battery composed of two hundred and seventy four-inch plates, upon the body of a criminal executed in Glasgow, Dr. Ure renewed the action of the diaphragm, and produced other effects of such an impressive description as to have induced him to hazard the opinion that, were it not for the injury which the subject of his experiment had sustained from the preparatory dissections, he would, in all probability, have been restored to life. This opinion, however, was probably a too sanguine one, for his experiments, repeated in the winter of 1829, with all the necessary precautions, by the professors of the Irish College of Surgeons, gave much less striking results. The voluntary muscles were, it is true, thrown into strong convulsive action, but all attempts to restore the respiratory movements were entirely unsuccessful. The mechanical injuries, indeed, sustained occasionally by the spinal marrow, and always by the larynx of individuals who perish by hanging, at least when they have fallen from a considerable height, preclude the possibility of complete recovery from any means whatsoever.

In asphyxia produced by concussion of the brain, there are strong reasons for believing that galvanism, properly applied, would prove extremely useful. This conclusion seems to have been drawn first by M. Gondret, (Journal de Physiologie, vol. iv. p. 382,) who had his attention particularly called to the subject by witnessing the death of an individual in the Ukraine who had fallen on his head from his horse, notwithstanding the sedulous application of all the analeptic means familiar to the physician. Upon his return to Paris he undertook an experimental examination of the efficacy of the pile in such cases, and found his expectations more than verified. In his first experiment, a rabbit, which had been to all appearance killed by a few violent blows inflicted with the hand upon the back of the head, was perfectly recovered by a succession of shocks, continued for half an hour, from a machine of thirty couples, and transmitted between the eyes, nose, and meatus auditorius externus, on the one hand, and different parts of the spine of the animal, on the other. In a second trial made with a stronger rabbit, the method just described did not produce the desired effect within the space of thirty minutes; but, upon removing the cuticle from the spine by the water of caustic ammonia, and then applying the pile as before, at the end of the second half hour the animal was restored to life, though it continued paralytic for a few days in its hinder extremities. Similar experiments have more than once been performed by the writer of this article, without any knowledge of the previous researches of M. Gondret.

In a note appended to the communication of M Gondret, Magendie states that he, Pouillet, and Roulin had repeatedly succeeded in recovering, by means of the pile, rabbits asphyxiated by submersion in water for more than a quarter of an hour, and adds the important remark that in such experiments patience on the part of the operator is particularly indispensable, inasmuch as, in cases finally successful, reanimation was often not achieved for full thirty minutes. These results illustrate much more forcibly than the experiments of Ure upon the murderer Clydesdale, the value of galvanism in the treatment of persons recently drowned, and the propriety of his recommendation that a voltaic battery should be included among the means of resuscitation provided by the Humane Society.

There can be little doubt that the pile would prove equally useful as a stimulant in cases of poisoning by narcotic drugs, or the inhalation of irrespirable gases, as in those already noticed. Experiments performed upon the lower animals justify this conclusion, though galvanism is not usually mentioned by toxicologists amongst the curative means to be resorted to on such occasions.

[It will be seen, hereafter, that electro-magnetism has been used with this view.]

Of all the diseases to which the human body is subject, paralysis is that in the treatment of which the galvanic shock is most frequently applied. Its peculiar effects on the muscular system, already so minutely dwelt upon, and the fact of its possessing the power of throwing even the muscles of a paralytic limb into convulsive action, have both suggested its use, and caused the highest expectations to be formed of its efficacy in the treatment of this affection. Nor have these anticipations proved entirely illusory. Galvanism has often of itself completely removed certain forms of such disease, and it is almost always a useful auxiliary to other lines of treatment. It should, however, be borne in mind that it is not equally applicable in every variety of paralysis. In cases, for example, of hemiplegia following a recent apoplectic attack caused by the extravasation of blood into the substance of the brain, it would obviously be absurd to expect any advantage from such a source. But when there is reason to believe the effused blood has been removed, and that the hemiplegia still continues, the pile may be advantageously resorted to for the purpose of stimulating the nerves, and thus rousing them to the performance of those functions which would appear, in such case, suspended from desuetude alone. It is, in fact, in paralytic affections of a purely functional kind, or which do not depend upon organic disease of the nervous system, or pressure exercised upon any part of it, that the agency of the pile can be rationally resorted to by the medical practitioner. Under this head may be ranged general or local paralysis arising from exposure to cold, palsy of the wrists from the absorption of lead, and many varieties of deafness and amaurosis. In all these cases, as the nerves are to be stimulated to increased action, an interrupted current must be employed, in the application of which the method of Ure should be followed, and all those particulars attended to which have been detailed in connection with the subject of asphyxia. The discharges of a galvanic battery and a Leyden jar produce sensations so analogous as to render it probable that they affect the living body in the same way, and that they may, therefore, be indifferently applied as stimulants to the nervous system. The pile, however, possesses many advantages which do not belong to the electrical machine. The quantity of electricity which it sets in motion is vastly greater, a peculiarity which may probably confer upon it a higher degree of medicinal power. There is no difficulty in bringing it into action in any kind of weather. The shocks it gives may be more exactly graduated, and admit of being directed with facility to organs which it is difficult, if not impossible, to subject to the influence of the common electric spark. This latter circumstance is most deserving of attention. To submit, for example, in cases of deafness, the auditory nerve to galvanic action, it is sufficient to introduce a wire connected with one of the poles of a battery into the affected ear, and the other wire into the opposite ear, the circuit being then rapidly broken and completed a number of times by an assistant, according to the method recommended by Dr. Ure, and which has been already so often alluded to. In amaurosis, the galvanic shock may, by obvious means, be transmitted at pleasure through the ball of the eye, so as to traverse the retina, or be confined to those twigs of the first branch of the fifth pair of nerves which ramify on the forehead above the orbit, and upon the state of which alone Magendie has shown (Journal de Physiologie, vol. vi. p. 156) that gutta serena often depends. In aphonia the circuit may be completed through the organs chiefly concerned in the production of the voice, by placing a shilling upon the tongue, and touching it with the negative wire of a battery whose other pole is alternately brought in connection with, and separated from, different parts of the external larynx, a method successfully employed by Mr. Miles Partington in a case, the particulars of which he details in the London Medical and Physical Journal, No. 294. These are instances of affections which have often yielded to the voltaic pile, but upon which the powers of the ordinary electrical machine scarcely admit of being brought to bear.

The shocks of the pile are not only adapted to the various forms of paralysis, but also to the different other diseases for which the sparks of the machine, and the discharges of the Leyden phial are prescribed. These it is not necessary to recount here, as they have been already enumerated in the article on ELECTRICITY, to which, therefore, we shall content ourselves with referring.

Whenever galvanism is intended to produce an exciting effect, it must be exhibited so as to produce shocks, or in the form of the interrupted current. There are, however, certain affections in which it is conceived most beneficial when flowing in a continuous stream, the specific effects of it when thus applied being supposed of a sedative kind. This opinion of the difference of action of the voltaic fluid, in the two conditions of it just described, does not rest upon mere conjecture. It is based upon the observation of medical electricians, and is, in particular, sustained by the following experiments. If a prepared frog be subjected to a quick succession of discharges by means of a feeble pile, or even a single couple composed of zinc and silver, its muscles are rendered permanently rigid, and it exhibits all over the condition of a tetanic patient; but upon now passing through it for some time a continuous current in the opposite direction, the muscles gradually relax, and finally attain their natural state. Again, if a recently prepared frog be submitted for some time to an uninterrupted current of galvanism, its excitability seems in a great measure destroyed; for upon subsequently applying shocks, by alternately opening and closing the circuit, either no spasms or very feeble ones will be produced. From facts such as these, Nobili (Annales de Chimie, tom. xliv.) concludes that all convulsive affections, not excepting tetanus itself, may probably admit of being controlled by galvanism, but that in these the method of its administration should be the opposite to that for paralysis, or, that instead of the interrupted, the continued current should be resorted to, and that to obtain the maximum tranquillizing effect, the electricity should be transmitted along the nerves in a direction contrary to that of their ramifications.

It is probably upon the same principle that the efficacy of the following galvanic treatment of an epileptic patient, by Dr. Pearson, (Revue Médicale, vol. iii., p. 323,) depended. The cuticle having been removed by a blister from the back of the neck and inner side of one knee, these parts were covered with bits of moistened sponge, upon which slips of linen were laid, and over all discs of silver and copper, the former metal being applied to the neck, the latter to the knee. The discs were then connected by a copper wire, which was attached to each by soldering, and enclosed in a pouch composed of chamois leather, so as to be insulated from adjacent parts. This apparatus having been applied for six months, a case of epilepsy which had resisted every other line of treatment was completely cured. It was found to continue in action for ten or twelve hours, after which it became necessary to clean the plates, and renew the pledgets of sponge and linen. [This mode of employing galvanism was recommended by M. Mansford in epilepsy, (*Researches into the Nature and Causes of Epilepsy*, Bath, 1819,) and hence the plates have often been called in this country, "*Mansford's plates.*"]

Galvanism in the form of the continued current has also been strongly recommended by Dr. Wilson Philip for the treatment of what he denominates habitual asthma, that is, simple dyspnœa, unaccompanied by pulmonary spasmodic action, or any tendency to thoracic inflammation. This particular application of it was suggested to him by the results of those experiments of his already discussed, in which, after the excision of portions of the par vagum on each side of the neck in rabbits, a stream of voltaic electricity not only restored the digestive process, but also removed the difficulty of breathing. His method was to apply a disc of silver to the nape of the neck, and another to the epigastric region, and then press the positive wire of a galvanic trough against the former, and the negative wire against the latter. His machine consisted of from eight to sixteen pairs of four-inch plates, and was charged with muriatic acid diluted with one hundred and twenty times its weight of water. The circuit was always maintained until decided relief was experienced, which usually occurred within from five to fifteen minutes. In every instance a suspension of the dyspnœa was thus effected, and in many cases the cure was permanent. The success which Dr. Phillip experienced in the treatment, upon this plan, of habitual asthma, led him to peculiar views respecting the pathology of this affection. The disease he conceives to consist in some impediment residing in the nerves to the transmission, from the brain, of galvanic influence, and the artificial electric current he supposes to operate by removing such impediment.

[The employment of galvanism, by means of the plates referred to above, has been recommended in cases of neuralgia; and, as a form of it, in Angina Pectoris. It was only found effectual, however, by Drs. Chapman and T. Harris (*American Journal of the Medical Sciences*, Aug. 1834, p. 311 and 384) in affections of the face, and had then to be persevered in for some time before marked benefit was experienced. About the same period, this mode of applying galvanism was adopted by Dr. Miller, then of Washington University, Baltimore, and a case of pariplegia, and another of general paralysis were published by him, in which it seemed to have been highly efficacious (*American Journal of the Medical Sciences*, Aug. 1834, p. 321). Dr. Hays (*Ibid.* Aug. 1840, p. 288) states that the most useful remedy in certain cases of amaurosis that fell under his care, was unquestionably galvanism. This was evinced not only in the improvement which followed its application, but in the still more striking fact, "that the patient saw better whilst subjected to the galvanic action. The galvanic current was made to pass from the mastoid process to the superciliary ridge.]

When the wires attached to the extremities of a trough are introduced into any animal fluid containing albumen, this latter principle, as first shown by Brande, separates at the positive pole, in the coagulated state. It has hence been suggested that galvanism might be applied to the important purpose of coagulating the blood within an aneurismal tumour, and thus removing the disease without resorting to the ligature. Experiments have been performed on rabbits by M. Velpeau, which demonstrate that the desired effect may frequently be produced by merely inserting a number of needles into the circumference of an artery, so as to present a mechanical impediment to the circulation through it. There can, however, be no doubt that coagulation and its wished-for consequences would, with much more certainty, be determined by completing the circuit of a pile for a few instants through each pair of opposite needles; but we are not aware that this method has as yet attracted the attention of the practical surgeon.

If the connecting wires of a common pile be made to touch a cut or ulcer within a short distance of each other, the animal fluids undergo the coagulation just described, and, by properly shifting the wires, this effect may be extended to the entire surface. With a machine consisting of from forty to fifty couples the effect resembles that which would be produced by a solution of nitrate of silver containing about five grains in the ounce of water; but, with a battery composed of two or three such troughs, the action is much more intense, and there is almost immediately formed an eschar of very considerable thickness. Galvanism may, therefore, be used as an escharotic, and this application of it has actually been made, and is strongly recommended by M. Pravaz, (Revue Médicale, Decembre, 1830,) to the bites inflicted by rabid animals. He details several cases in which this practice was successful, in one of which the cauterization was not resorted to until fifty-four hours after the reception of the bite. The battery which he used was of low power, consisting of only two troughs, containing between them but fifty pairs of electromotors. The eschar was usually detached on the eleventh day, and the cicatrization completed on the seventeenth.

In 1811, Mr. Berlioz (Edinburgh Med. and Surg. Journal, vol. xxvii. p. 191) revived in Europe a curative process long practised in the east, particularly in China and Japan, and which is usually known under the name of acupuncturation. He was also the first who proposed to combine with it the galvanic influence, a suggestion which has recently been very extensively acted upon, especially by the French physicians. *Electro-puncturation* [galvano-puncture] as it is usually denominated, is performed by inserting in the ordinary manner two or more needles into the part or organ affected, and then touching these with the wires from the poles of a feeble galvanic machine, the contacts being occasionally suspended and renewed, so as to produce a succession of shocks. It has been chiefly employed by Cloquet at the Hospital of St. Louis, and from the reports of his friend Pelletan and his pupil Dantes, and from the treatise of the Chevalier Sarlandière, it would appear to be a most powerful means of combating morbid action. The diseases in which it has been found most advantageous are the different forms of rheumatism and neuralgia; (in the latter affection the needles should be inserted in the course of the principal nerve, and the galvanic current transmitted in the direction of its ramification;) next in spasmodic affections, as muscular spasm, hysteria, and traumatic trismus; convulsive hiccup and vomiting; periodic epilepsy, preceded by pain in the mamma and, lastly, in inflammatory attacks, such as con tusions attended with extravasation and great pain upon motion, ophthalmia, pleurisy, carditis, and even erysipelas. It has also been used, and according to Mr. König, (Revue Médicale, April, 1830, p. 120,) with success, for promoting the absorption of the effused fluid in ascites; [and in hydrocele (Z. Pecchioli, in *Bullet. delle Scienze Medic. di Bologna*, Sep. 1841, cited in *Dublin Journal of Med. Sciences*, Nov. 1842, p. 311,)] and Carraro (Edinburgh Med. and Surg. Journal, supracitat) has proposed it for the treatment of asphyxia. [It has likewise been employed by M. Leroy d'Etiolles in cases of asphyxia in the mode described elsewhere. (See ASPHYXIA.)] In paralysis it is admitted to be of little use, except for relieving the pain, which is frequently the most distressing accompaniment of such disease. Amaurosis, however, when depending upon neuralgia, is said to be an exception to this statement. A well-marked case, also, of paralysis of the muscles of the right side of the face, accompanied by neuralgia of the portio dura on the same side, is related by M. Montault, (Revue Médicale, January, 1830, p, 63,) which was cured in about a week by inserting a needle through the nerve at its exit from the stylo-mastoid foramen, and four others in the course of its principal branches, and transmitting from the former to the latter a number of shocks once a day, from a pile of thirty couples. [M. Magendie regards electro-puncture as the remedy *par excellence* for obstinate neuralgia (*Med. Chirur. Rev.* January, 1841.)]

Admitting the efficacy of electro-puncturation in all these complaints, it is very difficult to form any plausible hypothesis as to the manner in which it acts. Some theories have indeed been hazarded on the subject; they are, however, so vague, contradictory, and insufficient, that it would be a complete loss of time to enter upon an examination of them.

In the therapeutic administration of galvanism, the feelings of the patient must be our guide as to the strength of the charge which should be employed in each particular case. Some will sustain with impunity the shocks of a battery which would prove most distressing and injurious to others. The dose may be graduated to any required degree of nicety by properly varying the interval between the conducting wires; for upon this, with a given machine and exciting fluid, will depend the degree of energy of the developed electricities. The strength, in fact, of the galvanic shock, as is well known, depends not upon the size, but the number of the couples which compose the battery. It is, however, influenced by the degree of concentration of the acid solution, and also by the interval between the adjacent pairs of metals, being connected with the latter in an inverse, and with the former in a direct ratio. The distance between the couples in the common trough should not exceed an inch, and for general purposes the best solution to employ is water containing one-twentieth its weight of strong nitric acid, and one-sixteenth of oil of vitriol. The wires used for completing the circuit should be furnished with insulating handles composed of glass, and be armed at their free extremities with balls of brass, or, what answers better, of silver, gold, or platina. Should such be wanting, silver discs (shillings will answer well) should be laid upon the parts of the body between which the current is to be made to pass, their position being occasionally changed to prevent the skin beneath from being injured. The subjacent cuticle, also, being a non-conductor, should be moistened with a solution of sal ammoniac or common salt.

[An apparatus has been invented by Mr. Coad, of Philadelphia, which enables galvanism to be communicated either continuously, or in an interrupted manner, and the dose to be regulated according to the wishes of the practitioner. It is an extremely convenient apparatus; and well adapted for all cases in which it may be deemed necessary to employ galvanism.]

We shall now conclude by a recapitulation of those general principles of practice laid down in the article on electricity, and which are equally applicable to the present subject.

1. Feeble powers should always be first tried; these should be gradually augmented, and the use of such finally persisted in as, without producing any violent effects, appear to make a decided impression on the disease.

2. Galvanism, as a remedial agent, must not be hastily given up because of its beneficial effects not immediately appearing, for these, generally speaking, require considerable time to be developed.

3. The pile should not be relied upon exclusively in the treatment of diseases, but should rather be considered as auxiliary to other methods of cure.

4. To the preceding we shall add, that, in cases where the continuous current may be deemed most advisable, it would be well to resort to machines composed of plates having an extended surface, there being reason to suspect that the curative influence of galvanism in this form depends not upon its intensity, but upon the quantity of it which is set in motion.

[For some inventions of a galvanic nature, proposed by different individuals,—as the *anodyne metallic* or *galvanic* brush of Von Hildenbrand; and the *electrizers, galvanic suppositories*, &c., of Harrington, the writer may refer the curious to another work. (*New Remedies*, 4th edit. p. 328: Philad. 1843.) They are no longer used.

Electro-magnetism is sometimes employed in the same cases as galvanism. The most convenient, simple, and powerful machine, according to Dr. Pereira, (*Elements of Materia Medica and Therapeutics*, Amer. edit. p. 75: Philad. 1843,) is one devised by M. E. M. Clarke, of London. It consists of a battery of six curved permanent magnets, and an intensity armature, around whose cylinders 1500 yards of fine insulated copper wire are coiled. The ends of this wire communicate respectively with a pair of directors, each holding a piece of sponge, (dipped in vinegar or a solution of common salt.) When the armature is rotated, and a portion of the living body interposed between the directors, a succession of shocks is experienced.

An electro-magnetic machine is not affected by the moist state of the atmosphere; and as acids are not needed to excite it, it is more convenient than the galvanic battery when an interrupted current is needed. A case has been recorded recently by Dr. T. S. Page of Valparaiso, in which this apparatus was used most beneficially to rouse a patient from his stupor when under the influence of opium. One ball was applied over the region of the heart, the other to a corresponding point on the right side. (*Lancet*, Feb. 4, 1843, p. 672.)

Of late years, electricity has been much employed at Guy's Hospital, London, either in the form of sparks drawn from the patient, of shocks from the Leyden jar, or of galvanic shocks administered by means of an electro-magnetic apparatus; and the diseases in which it has proved most serviceable in the hands of Dr. Addison, (*Guy's Hospital Reports*, No. 5, Oct. 1837,) and of Dr. Golding Bird, (*Ibid*, No. 12, Oct. 1841,) are chorea, paralysis from functional disorders of the nervous system, and amenorrhœa.

There are doubtless many cases of disease in which the excitant and revulsive agency of galvanism — and the same may be said of electro-magnetism — may be employed with advantage, but they are not so numerous as was at one time believed. The writer has used the plates extensively—in neuralgic cases especially—but has not experienced so much success from them as to induce him to advise them frequently under the inconveniences that necessarily accompany their employment. They are, indeed, not often used.

Robley Dunglison.]
James Apjohn.

[GANGRENE. (See Inflammation and Mortification.)

GANGRENE OF THE LUNGS. (See Inflammation and Pneumonia.)]

GASTRALGIA. (See Gastrodynia.)

GASTRITIS, from γαστὴρ, the stomach. This term is commonly used to express an inflammation of all the tunics of the stomach, with the exception of its serous covering; but as it is now generally believed that this diseased action commences in the mucous membrane and glands, the term is employed to designate an inflammation of the internal tunic, which may or may not affect the remaining tissues, from the violence or chronicity of the disease, the habit of the patient, &c.

The stomach is admitted to be one of the most important of organs: its existence forms a distinguishing characteristic of most classes of animals; its function is the foundation of all animal organization; it is placed, as it were, in the centre of the economy; it is abundantly supplied with nerves of animal and organic life; and its sympathies are more remarkable, direct, and numerous than those of any other organ. These considerations explain the severity of many cases of gastritis; its great variety of symptoms; the fatal nature of the disease in its more acute forms, and its danger in all cases.

In a former article the history and pathology of enteritis were described; in this we shall consider solely the localization of inflammatory disease in the stomach.

In the article Enteritis the difficulty of investigating the symptoms of inflammation of the stomach, as distinguished from those of enteritis, was alluded to. This arises from the frequent coexistence of the two affections, a fact admitted by almost every pathologist. It is indeed difficult to explain how Dr. Abercrombie has arrived at a very opposite conclusion. In his work on the Diseases of the Stomach and Intestines, he says, "I have been often very much astonished to find in my own observation how seldom the stomach shows marks of inflammation, even when the organs most nearly connected with it have been inflamed in the highest degree."

But in the present state of medicine we cannot admit the opinion of Broussais, that the two affections are always coexistent, as cases are on record which are inconsistent with it.

Thus, in the last edition of Andral's *Clinique Médicale*, tom. i., we find the thirty-ninth and forty-second cases are examples of severe gastritis, without inflammation of the intestine; while, on the other hand, the first, third, ninth, tenth, eleventh, nineteenth, twenty-eighth, thirty-fifth, and forty-third cases are examples of enteritis, in some instances very intense, without any gastric inflammation; so that, excluding all doubtful cases, we have in the recorded investigations of a single author, out of fifty-three instances of inflammation of the digestive tube, nine where the stomach remained healthy, and two where this viscus alone was engaged.

I. Acute Gastritis. — Inflammation of the stomach [endo-gastritis] in its highest degree is rarely met with, unless in cases of corrosive poisoning; but by the study of these we may learn the prominent symptoms of the most violent gastritis, which, when separated from those apparently arising from other causes, are the following: intolerable thirst, constant nausea and vomiting, præcordial distress, sunk countenance, extraordinary prostration, fever. These symptoms occurring in a case where no poison had been administered, would point out the existence of the most severe gastritis.

The disease, however, occurs with such various degrees of intensity that it is difficult to give any single description of it. In one case it will destroy life with rapidity and with the most dreadful sufferings to the patient; in another it may represent a slight dyspepsia: between these extremes the shades are infinite. In some of the more violent cases there has been fever, at first inflammatory, but speedily assuming the typhoid type; the patient complains of a burning sensation in the stomach, with ardent, unquenchable thirst, and a desire for cold and acidulated drinks. From the extreme sensibility of the stomach, the fluid swallowed is in most cases immediately ejected, and often the least irritating substances will cause heat, pain, and vomiting. There is generally great tenderness of the epigastrium, so that the slightest touch, the weight of the bed-clothes, or any muscular effort, will produce severe distress. Respiration is accelerated and difficult, although no disease can be detected in the thoracic viscera by auscultation; or if there be, it will not be sufficient to account for the symptom. The patient is restless and anxious; the features are contracted and often distorted, and the prostration of strength (so constant in gastro-intestinal inflammation) is peculiarly marked. Constipation of the bowels occurs, — a symptom common to both acute and chronic inflammations of the upper portion of the digestive tube.

"The symptoms," says P. Frank, "increase with rapidity: scarcely has the patient, with an intolerable burning sensation, swallowed a small quantity of an insipid fluid, than it is rejected, either pure or mixed with eruginous bile. The pulse is small, frequent, contracted, and hard, or intermittent and unequal. The agitation, dyspnœa, restlessness, thirst, and dryness of the mouth go on increasing; hiccup, which greatly aggravates the sufferings of the patient, appears; the extremities become cold; and in some cases delirium and jaundice are observed. In the last stage all sensation of heat and pain in the epigastric region disappears; the flatulent swelling of the belly increases; drinks are rejected by regurgitation, and a serous fluid is often discharged with force; the extremities become as cold as marble, and fainting and convulsions announce the fatal termination."

This is the phlegmonous gastritis of the older authors, as distinguished from the erysipelatous. In modern medicine the terms acute and sub-acute have been substituted. Little advantage, however, is derived from this distinction, as the disease is essentially the same, though occurring under a thousand modifications of intensity.

Patients labouring under severe gastritis often complain of a sensation very analogous to the globus hystericus. They feel as if a round body was rising up and compressing the lower part of the chest; vomiting often relieves this symptom for a time, and hence the patient frequently urges his attendants to give him a full emetic, in the hope of expelling the supposed foreign body, to which he attributes his distress. This sensation is probably caused by spasmodic stricture of the cardia, which may extend to the œsophagus. It has been observed that in some cases swallowing was impossible, and the patients referred the obstruction to the lower portion of the pharynx or upper part of the sternum,—a symptom supposed by Broussais to indicate that the whole stomach is violently contracted, so as not to admit of any dilatation. This contracted state of the organ has been verified by dissection, the capacity of the stomach having been found reduced to that of a portion of the small intestine.

Connected with the symptom of dysphagia, we may place hiccup, which is one of the most distressing symptoms in these cases: it is most commonly observed in the latter stages of the disease, but we have seen it occurring at the outset, and are led to believe that it then marks a predominance of inflammation around the cardiac orifice. A case of this description lately occurred under our care in the Meath Hospital, in which, after the sudden disappearance of a pneumonia of the lower lobe of the left lung, the patient was attacked with vomiting, followed by severe hiccup. There were extraordinary prostration of strength, thirst, and a craving for cold and acidulated drinks; the epigastrium was tender, and the bowels were confined; the tongue was clean and moist; the hiccup continued incessant even during sleep, though then somewhat modified. Notwithstanding active treatment for the gastritis, death took place on the fourth day of the abdominal disease. On dissection, we found that the inflammatory action was circumscribed in a most remarkable manner for about three inches round the cardia. Here the mucous membrane was of a blood-red colour, thickened and softened, while that of the rest of the stomach was perfectly healthy. The lower portion of the œsophagus was vascular, and the cuticle separated so as to form shreds on the surface of the tube. A similar state of parts was recently observed in another case in Dublin, in which incessant and intractable hiccup was the prominent symptom.

Deep-seated and lancinating pains have occurred in this disease, referred to the epigastrium and hypochondria; and Broussais notices it as an interesting fact, and as indicative of their nature, that they are frequently relieved by cold acidulated drinks. Connected with these painful sensations is another characteristic symptom—the patients constantly throw the bed-clothes off from the chest and epigastrium. This has been supposed to arise from their inability to bear even the slightest pressure on the part, an explanation which may be partly true; but it also seems probable that the desire of cold to the surface is another cause. In some cases we have observed this tendency to be irresistible, although the intellects were perfect: the symptom, however, is not peculiar to gastritis, but occurs in many cases of gastro-enteric inflammation in the acute stage.

The tongue has been described as presenting peculiar characters in this disease; but this appears to be one of those statements taken by writers on trust, of which there are far too many in medicine. Let us examine the state of our knowledge on this subject.

With respect to the question as to whether the state of the tongue indicates any certain condition of the stomach, or *vice versâ*, Andral comes to the following important conclusions:—1. That no constant relation can be established between the state of the tongue and that of the stomach. 2. That there is no modification of the tongue which corresponds with a special modification of the stomach. 3. That a certain state of the stomach may be found after death, with various appearances of the tongue during life. 4. That a morbid state of the stomach may coincide with a healthy state of the tongue, and a healthy condition of the stomach with a diseased condition of the tongue. (Clinique Médicale—Malad. de l'Abdomen.) Louis comes to almost the same conclusion in his *Recherches sur la Gastro-entérite.* He says, "In most of those cases where the mucous membrane of the stomach presented the greatest lesions, the tongue was generally in its natural state;" and again, page 66, he says, "so that whatever was the state of the tongue, it had not the slightest relation with that of the stomach; the same appearance coinciding with a more or less severe lesion of the gastric mucous membrane in one case, and with the healthy condition in another."

It may be objected however, that these observations were made on that class of affections called *fevers*, and that the conclusions would not apply to idiopathic gastritis. But when we recollect the great similitude that exists between cases of idiopathic gastro-enteritis and fever, and also that in other diseases, not of the stomach or intestines, all the morbid appearances of the tongue may occur, it is difficult not to make a general application of the conclusions of the above authors; and M. Piorry (Journal Hebdomadaire de Médicine, No. 60, 1829) declares that in many cases of well attested acute gastritis the tongue continued pale. From these facts we must conclude that in gastritis no constant state of the tongue exists; this is more particularly true in the less severe and chronic forms of the disease, and in the gastric inflammations which occur in fever. In the acute species and in cases of corrosive poisoning, a red and dry tongue has been often observed, and in some the tongue is glazed and morbidly clean. This state often occurs with a great amount of gastro-intestinal disease. It is of great importance, however, that the researches of Andral, Louis, and Piorry on the relations, in disease, between the state of the tongue and the gastro-intestinal surface should be extensively known, particularly in these countries, where the state of the tongue is so constant a guide in practice, and where, of course, if the conclusions of those authorities be correct, such practice must be often erroneous. It should never be forgotten that a perfectly healthy tongue may and often does coincide with a profound disease in the stomach, and a diseased tongue with a perfectly healthy state of that viscus.

The sympathetic affections in this disease are generally severe and numerous, and in certain cases may become predominant. In most instances of acute gastritis there is lesion of the cerebro-spinal functions; and in some, an inflammation of the brain may actually take place. Under these circumstances, we may have the most violent nervous symptoms without our being able to detect by the scalpel any lesion in the brain or spinal marrow; and, on the other hand, the various shades of arachnitis and encephalitis may be thus produced. The two following examples of severe nervous symptoms apparently caused by gastric irritation, and in which no lesion was found in the nervous centres, are so remarkable that we shall not apologize for their introduction.

A patient, aged forty-five, of a strong constitution, entered the hospital of La Charité on the 14th of October, 1820. He was then in such a state of delirium that no account of his former state could be obtained from him. On the morning of the 5th, the following symptoms were observed: eyes haggard, risus sardonicus, taciturnity; when the belly is pressed the countenance expresses pain, but the same is observed when pressure is made on any of the limbs; *tongue moist and natural;* respiration free; pulse full, somewhat frequent; some heat of skin. He died in the evening. On dissection, the brain and its membranes were found perfectly healthy; no effusion existed either at the base or in the ventricles. The lungs and heart were healthy, *but the stomach presented several recent ulcerations, with red bases, and between which the mucous membrane was vascular.* In the rest of the canal nothing morbid, except a few red patches, was observed. The other organs were all in their natural state. (Clinique Médicale — Malad. de l'Abdomen, Obs. xxxix.)

Here we see a pure gastritis, in which the prominent symptoms were those of an inflammation of the brain; and in this case, and in that which we shall next quote, a remarkable feature in the history of gastritis is illustrated, namely, *that when the sympathetic symptoms acquire a certain degree of intensity, the more usual, or what may be called the local symptoms, are often either greatly lessened, or altogether wanting.* But this absence of proper symptoms does not indicate that there has been a metastasis of inflammation, or in other words, that the stomach has become healthy.

The next case is also from the same author. A middle-aged man, four days before his entrance into hospital, was seized with bilious vomiting, epigastric pain, and fever. In about twenty hours after the invasion of these symptoms, he first perceived a difficulty in depressing the jaw, and a violent trismus was soon established, which continued for the two following days. At the end of this time he entered the hospital in the following state: — trismus, the head drawn backwards and forcibly retained in this position by the muscles which are inserted in the occipital region; rigidity of all the extremities; abdomen hard as a board; the intellect perfect: notwithstanding the trismus, the patient could articulate with sufficient distinctness to give the above account of his case. *From the time when the first tetanic symptoms appeared, the vomiting and epigastric pain ceased.* He died on the evening of his admission. On dissection, no appreciable alteration was found in the brain or spinal marrow; the meninges of the brain were very slightly vascular, but those of the spinal marrow pale. The whole surface of the stomach presented an intense red colour, which was at first concealed by a thick layer of mucosities. The remainder of the digestive tube was perfectly healthy, and the thoracic organs were natural.

There can be no doubt that the condition of the stomach in this case was the result of an intense inflammation, as no other cause for vascularity existed, such as a mechanical obstruction to the circulation. The healthy state of the remainder of the tube, and the accordance between the first symptoms and the condition of the stomach are also of importance with respect to this conclusion.

A patient, aged 30, addicted to the use of spirits, was admitted into the Meath Hospital in March, 1832, labouring under violent maniacal excitement; the eyes bloodshot, and the aspect ferocious. He had thirst, a dry and shrivelled tongue, but the belly did not seem tender; the pulse was quick and weak, the bowels were constipated. No accurate history of his previous state could be obtained. The cerebral symptoms increased so as to require the use of the strait-waistcoat, and continued with violence until a short time before death, which occurred on the eighth day after his admission. On the third day the belly was slightly tender, and somewhat tympanitic, and we applied a blister, but without relief. Opium and the cold affusion failed to relieve the cerebral symptoms. On dissection, no appearance of inflammation was found in the brain or its membranes. Some serous effusion existed in the cavity of the arachnoid, but none in the ventricles. The splenic extremity of the stomach was marked with patches of dotted redness, and the mucous membrane softened. The lower half of the ileum, the cæcum, and part of the ascending colon presented marks of intense inflammation, and were studded with numerous ulcerations, some of which, at the termination of the ileum, were of great extent.

We may enumerate the nervous symptoms in gastritis as follows: — prostration, subsultus, coma, all the shades of delirium, headach, intolerance of light, exaltation of muscular force, convulsions, tetanic spasm.

A sympathetic cough, sometimes of great severity, may occur as a consequence of acute gastritis; and, as is the case with respect to the brain, actual disease of the lung may result if the irritation be severe or long-continued, or if the patient have a predisposition to pulmonary disease.

In the *Histoire des Phlegmasies Chroniques*, a number of these cases are detailed. In some the disease simulated inflammatory catarrh, and in one pneumonia. The principal symptom was a violent cough, often occurring at each inspiration, and more severe during the exacerbations of the fever. In no case did those violent paroxysms occur which, as in pertussis, produce swelling and lividity of the face; but in all, this severe cough, "à secousses," continued during the disease, and was sometimes accompanied by a tearing pain.

As might be expected, hæmoptysis and many forms of bronchial secretion may be produced — an indication, to use the words of Andral, that the lesion of innervation has been followed by that of circulation and secretion. But notwithstanding these symptoms, so likely to mislead, we have, thanks to the advanced state of medicine, two sources by which a true diagnosis may be arrived at. One of these is the fact, that these pectoral symptoms are more relieved by the treatment of gastritis than by that of inflammation of the lung; more relieved by cold drinks and leeches to the epigastrium than by the use of the lancet. This, any practitioner who has the charge of an hospital will have opportunities of verifying. The second is derived from the use of percussion and the stethoscope, by which, as has been before stated, we find one of two things, either that there is no disease in the lung to account for the violent cough; or, if there be disease discoverable, it is not of sufficient extent or intensity to account for the symptoms.

Under such circumstances, particularly if fever exists, and there is no laryngeal disease, the source of the cough is to be sought for in the digestive system. This sympathetic cough has been long noticed as arising in cases of abdominal irritation, such as worms; but in these countries its supervention in acute gastro-enteric inflammation has not been sufficiently studied. The modification of the principal symptoms of gastritis in this case would greatly increase the liability to error; and the common practice of exhibiting tartar-emetic in pulmonary inflammation would, under such circumstances, be followed by the worst results. We have little doubt that, had Laennec lived much longer, he would have altered his opinion as to the safety of this remedy in cases of pulmonary combined with gastric disease; as a very extensive experience has convinced us that even a slight shade of gastro-enteritis is sufficient to contra-indicate the use of tartar emetic in cases of pulmonary disease. In such cases its specific action fails, and the abdominal inflammation is sure to be increased.

Acute gastritis may be accompanied by various forms of fever, so as to represent the inflammatory, ataxic, or adynamic species. Most generally, however, the fever is of one of the two latter types; and it too often happens that the existence of the adynamic symptoms leads to the most erroneous and fatal practice. In the prostration of strength, the petechial eruption, and other analogous symptoms, the symptomatic physician sees nothing but direct debility. The disease is to him a *typhous fever*, and the gastric inflammation is exasperated by stimulation, which adds to the debility by increasing its cause. An extensive knowledge of the state of the science on this subject, a sufficient experience, and a most accurate investigation of the early symptoms, are all necessary for determining the question. Often has it happened to us to see patients to whom stimulants had been administered with an unsparing hand, notwithstanding a progressive prostration, (a circumstance that should have led to a suspicion of the state of the parts,) whose life was distinctly saved by the inhibition of all stimulants, the use of ice, and the application of leeches to the epigastrium.

The fever also may be remittent or intermittent. In a case recorded by Mr. Annesley, in which death took place in seven days, the symptoms were constant vomiting and hiccup, with a tertian fever. The patient did not complain of pain. On dissection, the stomach was found studded with small ulcers.

Before proceeding to the consideration of other forms of gastritis in the adult, we shall examine the acute form of the disease, as occurring in infants. Like enteritis, inflammation of the stomach may be an intra-uterine disease; a fact established by the researches of Billard. But we must avoid confounding a congested state of the mucous membrane with inflammation, and this is the more important as congestion of the stomach is common in new-born children, particularly in those who have died by asphyxia. There is, however, decided evidence that gastritis may occur during fœtal life. We shall on this subject abridge two cases from the work of the author just named.

A new-born male child died on the evening of his exposure at the Foundling Hospital of Paris, the symptoms being severe crying, almost permanent contraction of the features, and some vomiting of brownish matter. On dissection, the great extremity of the stomach was found eroded by numerous irregularly-rounded ulcerations, which evidently resulted from the destruction of the mucous follicles, as some of these were found but partly ulcerated. The bases of these ulcers were of a bright yellow colour, and the edges, slightly tumefied, were vividly red, so as to form a striking contrast with the rest of the mucous membrane. In this case the author conceives that the development of the gastritis must have been recent, as there was no emaciation, and the disease did not seem to have arrested the process of the fœtal evolution. Billard has frequently seen this disorganization in children who have died shortly after birth, and in whom there was also no emaciation. From these circumstances he is led to believe that when the follicular ulceration of the stomach occurs as in intra-uterine disease, it is most commonly developed during the last days of fœtal life.

In the next case the disease was more chronic. A female infant was deposited at the hospital in a pale, emaciated, and feeble state. The exhaustion increasing daily, she was sent to the infirmary six days after birth. On admission, the lower extremities were œdematous and hard, the body pale, the mouth dry, the skin arid and hot, and the pulse very small; there were also bilious diarrhœa, and the signs of hepatization of the left lung. Death took place in nine days, being preceded for two days by abundant vomiting, which followed the cessation of the diarrhœa. On dissection the œsophagus was found intensely red and tumefied. The mucous membrane of the stomach was generally white, but in the lower portion of the pyloric third a deep round ulcer, with elevated edges, of a reddish-brown colour, was found; this was not surrounded by any inflammatory tumefaction; its base was of a dark colour, and formed by the serous membrane alone. In this case the death is attributable to the pneumonia and œsophagitis, and probably the debility and emaciation to the ulcer of the stomach.

But gastritis is not unfrequent in infants as a disease occurring after death. It is most commonly complicated with enteritis. Thus, out of one hundred and fifty cases of inflammation of the digestive tube, observed in the Foundling Hospital of Paris, there were ninety cases of gastro-enteritis, fifty of enteritis without gastritis, and only ten of gastritis without enteritis. Four varieties of gastric inflammation have been described as occurring in infants, and the following is Billard's arrangement of these forms of disease:

1. Erythematous gastritis.
2. Gastritis with alteration of secretion.
3. Follicular gastritis.
4. Gastritis with disorganization of tissue.

By the first is implied an inflammation of the mucous membrane, of which vascularity is the principal character; the second is a state of the stomach identical with that of the mouth in the disease called *thrush* in these countries; the third is analogous to the dothin-enteritis of Bretonneau, consisting of an inflammation and ulceration of the mucous follicles; and the fourth comprises gangrene, and the peculiar disease described by Cruveilhier and Guersent under the name of the gelatinous softening of the stomach.

We must not, however, suppose that these forms of disease are essentially different affections. They are all examples of inflammation, varying in degree, in seat, and in result, according to the violence of the disease and constitution of the patient; they may succeed one another, or even occur together, as was the case in the thirty-fourth case of the above author, where erythematous redness, the peculiar alteration of secretion, the follicular ulceration, and the gelatinous softening occurred together. The existence of the second variety has been doubted, but is established by the researches of Billard; it is certainly rare, and was consecutive to the disease in the mouth.

There is but little to be added with respect to diagnosis to what has been already laid down. Vomiting, tension, and pain of the epigastrium; painful cries when this region is pressed, and alteration of the countenance, are the principal signs of gastritis in the new-born infant. Should such symptoms arise when the mouth is affected with thrush, it becomes probable that the disease has extended along the œsophagus to the stomach; vomiting of a dark and sanguinolent matter has been observed in the follicular species: but in one respect the gastritis of very young infants differs from that of the adult, namely, in the almost total absence of febrile re-action.

In the article Dentition will be found Cruveilhier and Guersent's descriptions of the *gelatinous softening* of the stomach, with the symptoms as observed by them. To this we beg to refer, but in order to embody as much information on this interesting subject as possible, we shall introduce the description as given by Billard.

"The disease generally commences with symptoms of a violent gastritis, such as tension of the epigastrium, which is painful to the touch; vomitings, not only of milk and drinks, but also of a green and yellowish matter, which come on every moment without regard to the time when the child has taken food or drink. There is sometimes diarrhœa, varying in different subjects, and returning after having ceased for a day or two; the matters discharged being often green, like those from the vomiting. The extremities are cold; the pulse is generally irregular, but seldom presenting a regular character; the countenance expresses pain constantly, the face remaining furrowed as if the infant were crying; the cry is expressive of pain, the respiration interrupted, and the general agitation so great that the existence of a cerebral affection might be suspected. To these symptoms succeeds a state of prostration and insensibility, from which the child is occasionally roused by pain, when the agitation observed at the early periods of the attack reappears. At length, at the end of six, eight, or fifteen days, and sometimes even much later, the patient sinks exhausted by want of sleep, constant vomiting and pain: in very young infants there is little or no fever."

The result of this disease is the reduction of the mucous membrane to a gelatinous pulp, and such a thinning and softening of the parietes of the stomach that the slightest force will produce a rent. According to Baron and Billard this condition of the stomach is most evident in the greater curvature. In the adult a very analogous affection is observed, to which we shall presently allude.

II. Chronic Gastritis.—Since the improvement in our knowledge of pathological anatomy, this disease has been found to be much more frequent than was formerly supposed; and numerous instances of what had been believed to be merely dyspepsia, are now proved to be in reality examples of chronic inflammation. Here is one great instance of the improvement in medicine by means of pathology; and in the treatment of these diseases, the tonic and stimulating plan must speedily yield to the judicious employment of the antiphlogistic mode, and a physiological be substituted for an empirical treatment. But we are far from going to the full length of the doctrines of Broussais on this subject. There are too many instances of functional disease of the stomach on record to allow us to doubt that there may be dyspepsia without gastric inflammation; in fact a lesion of innervation without inflammatory action is a condition common to the viscera, and it would be strange if the stomach formed an exception. It is certain that cases of dyspepsia will mend under a treatment not calculated to remove inflammation; but it is also undeniable that a great number of dyspeptic and hypochondriacal cases, so far from being benefited, are made worse by such a proceeding. The failure of one stimulant or tonic remedy is followed by the trial of another, until the patient sinks; and on dissection, various results of chronic inflammation are found in the upper portion of the digestive tube. The error of confounding these diseases is one easily fallen into, as in many cases the symptoms are the same, and the fact of chronic gastritis being frequently an apyrexial disease contributes to perpetuate the error. When we consider that in most cases the exciting cause of dyspepsia is an over-stimulation of the stomach, and recollect the law in pathology, that functional seldom continues long without inducing organic disease, we cannot help believing that in most cases of chronic dyspepsia there is more or less of gastric inflammation. Whether this has been the primary affection, or has succeeded to the functional disease, is of comparatively little importance, as its existence is the great point on which turns the success of our treatment. We can assert with confidence, that in numerous cases of chronic dyspepsia, where the fullest trial had been given to the whole class of *stomachic* remedies without relief, the disease has yielded to a strict regimen, with local bleeding and counter-irritation on the epigastrium. Andral, in his *Précis d'Anatomie Pathologique*, declares that, of all the forms of dyspepsia, that from irritation of the stomach is by far the most frequent.—(See the article INDIGESTION.)

In the present state of the science we cannot fix on any symptom sufficient to distinguish chronic gastritis from functional derangement. Painful digestion, loss of appetite, irregular appetite, flatus, eructations, acidity, pyrosis, vomiting, unhealthy states of the tongue, with other symptoms, are common to both; but if the disease be chronic, and if it has resisted the tonic and stimulating plan, the probability of its being a gastritis is almost converted into a certainty. It is scarcely necessary to add, that in the diagnosis the relative frequency of the two affections is never to be forgotten. This point will be fully considered in the article just referred to.

Chronic gastritis occurs with a great variety of symptoms. It most commonly commences in a very insidious manner, and may continue for a length of time without much injury to the general health, and may even coincide, according to some authors, with an increase of nutrition. At this period the disease is too often exasperated by the use of the common anti-dyspeptic medicines; the habits of the patient remain unaltered; and it is not until the symptoms become severe that the disease is suspected. Of these the most frequent appear to be pain and vomiting. The first is commonly felt during the process of digestion, when it is generally severe, and in some cases intolerable; but it subsides either altogether or in a great degree when the stomach becomes empty. The seat of this pain is various, but is generally in the epigastrium or hypochondria, and it may extend to the back. In some cases it is described as being lancinating, in others dull, and may be accompanied by a feeling of constriction and globus, as in the more acute forms of the disease. The epigastrium and left hypochondrium are generally tender, and, when the disease is established, often present a remarkable fulness and resistance to pressure. Vomiting is the next most frequent symptom. In some cases the ingesta alone are rejected, and the vomiting occurs sooner in proportion to the quantity and stimulating nature of the food; but in some severe cases the most unirritating substances are speedily rejected. Great relief often follows the vomiting, and the patient continues comparatively well until he next attempts to take food. Even when the stomach does not contain food, vomiting may occur; and we have known an instance where the patient had acquired the habit of vomiting at will, so as to relieve himself from painful sensations. When vomiting does not occur, the sufferings of the patient are often great. In some instances the process of digestion goes on well, until, as the patient describes it from his feelings, the food arrives at a particular part of the stomach, when pain is induced and the food speedily rejected. This appears more common when the disease is severe but circumscribed.

There is a great variety in the matter ejected. Sometimes there is nothing but an insipid watery fluid; in other cases it is like the white of eggs; it may be intensely acid and acrid; dark-coloured, bilious, or bloody. In one case we have seen a fluid of a blue colour ejected in considerable quantity. Hæmatemesis is a common attendant on this disease; in some cases proceeding from an exhalation, in others from ulceration of large trunks, as described by Prost; but independent of the latter case, many instances of hæmatemesis are closely allied to gastritis,—a point of the utmost importance in treatment. Gastritis may commence by hæmatemesis; will often follow on its suppression, and the treatment of gastric inflammation is that which will most frequently succeed in removing the symptom. The analogy of active hemorrhage in other situations strongly corroborates these views. (See HÆMATEMESIS.)

As the disease advances, other symptoms present themselves. In the most severe cases there is complete loss of appetite; but in the less violent this is not observed. The appetite may be capricious, as in pica; and in some instances the taking of food gives temporary relief to a gnawing sensation in the epigastrium. Bulimia has been described as a consequence of this disease, but further researches appear necessary on this subject; and it is probable that the more remarkable cases of this affection have depended on causes very different from gastric inflammation. Anorexia, however, is one of the most constant attendants on the disease, and many lesions of the stomach may exist without causing any other symptom than a complete loss of appetite.

An exceedingly frequent symptom in chronic gastritis is a constipated state of the bowels; and relief to a certain degree follows the action of purgative medicine. From this circumstance the patient often attributes his sufferings to the constipation; and the same view is too frequently taken by his attendant. What is an effect is considered as a cause, and purgatives are looked to as a means of cure; the disease is allowed to run on until it has passed the reach of art, aggravated no doubt not only by the want of antiphlogistic treatment, but by the acrid substances themselves, which are poured in increasing quantities into the suffering organ. We shall revert to this in considering the treatment of the disease in the advanced stages.

The appearance of the patient is generally characteristic. There is great emaciation, with a countenance expressive of distress, sallow, and with dusky patches on the malar eminences. The skin has a semi-jaundiced appearance, and is at times tightly drawn over the emaciated muscles, so as to resemble that state in horses called *hide-bound*. The tongue presents various appearances, and in this, as in the acute disease, can seldom be considered as indicative of the condition of the stomach. As might be expected, the sympathetic irritations are by no means so well marked as in acute gastritis; but they may all occur. In some cases fever, generally of a remittent character, has been observed.

The disease terminates variously. In some cases, death occurs apparently by exhaustion; in others by peritoneal inflammation, induced by a perforating ulcer of the stomach; but its most frequent termination is by extension of disease to other parts of the digestive system, which are generally the duodenum, liver, and spleen: in this way dropsy may be the result of the disease. In other cases the ileum and colon become engaged, and the patients sink from diarrhœa. Fatal vomiting of blood has sometimes occurred, apparently the result of the erosion of large vessels.

It is a remarkable fact that circumscribed gastritis may exist in a manner almost completely latent. Dr. Abercrombie gives a case where the symptoms had been merely those of slight dyspepsia, yet in which fatal perforation occurred from ulceration; and the same author gives, on the authority of Dr. Kellie, an instance of a young and healthy female who had never complained of any gastric symptom, when she was suddenly seized with violent peritonitis, which proved fatal in eighteen hours, and on dissection was found to be caused by a perforating ulcer in the lesser curvature, around which there existed unequivocal marks of extensive and chronic disease. The patient had resided for four months in the house in which she died, and was never known to have complained of her stomach. Some months previously she had laboured under fever.

It is not uncommon to meet with these circumscribed ulcerations in the dissection of persons who have died of other diseases. Under these circumstances, they are generally either altogether or partly cicatrized, presenting rounded and thickened edges, which are seldom vascular. The base of these ulcers often consists of the serous membrane, which has formed adhesions with the liver, pancreas, spleen, or colon. In our dissections at the Meath Hospital we have seen many examples of these. A most remarkable case of communication between the stomach and colon is detailed in the work just quoted. The patient had complained of slight dyspeptic symptoms for some time, when his appetite became impaired; he had some loss of flesh and occasional pain in the abdomen. These symptoms continued for two or three weeks, when he was suddenly seized with fæcal vomiting. He felt no other inconvenience for a week afterwards, when he was again attacked in the same manner. This symptom returned frequently for three months, when death took place. On dissection, nearly the whole of the great curvature of the stomach was found ulcerated; in its centre an opening of two inches in diameter, communicating with the arch of the colon, was observed.

As the pathological anatomy of the stomach differs in no respect from that of the intestines, we shall refrain from entering into a description of it here, the subject having been already discussed in the article Enteritis, to which we beg to refer. The attention of pathologists has been of late directed to an affection of the stomach in which there is a remarkable softening of its coats. To this we have alluded in describing the gastritis of infants. In the adult it is not unfrequently met with; but though in some cases it is to be referred to a process of inflammation, yet it will often occur under different circumstances. We beg to refer to the writings of Cruveilhier, Louis, and Andral on this subject, and merely remark here, that in the inflammatary species redness generally accompanies the softened state of the tissues.

One of the most interesting and instructive circumstances connected with the history of chronic gastritis is the supervention of acute attacks on the chronic affection. This is often brought about by the use of a too stimulating regimen, but more frequently by the injudicious exhibition of tonic, stimulating, and purgative medicines. It is generally pointed out by the occurrence of fever: the tongue is altered, and the thirst becomes urgent. In other cases which we have observed, there has been no fever, but the appetite has altogether failed, the pain has increased, and the prostration of strength has become alarming. In some cases hemorrhage may take place, which is followed by great alleviation of all the symptoms.

An interesting example of this aggravation of symptoms occurred to the writer during the last year. The patient was a woman aged 50, who had laboured for nearly a year under the symptoms of schirrhus of the pylorus. In three months after her first illness, a tumour appeared, which, when first seen by the writer, was extensively moveable, occupying the median line, but evidently passing under the left ribs. This had formed adhesions with the abdominal parietes, and in its centre existed an ulcerated opening, through which any fluid taken into the stomach was instantly projected in a small jet. The fistula was closed by a compress and roller; and as the patient seemed almost in articulo mortis, some wine and animal food were allowed. This was followed by burning pain in the stomach, great thirst, heat of skin, a quick and wiry pulse, red and dry tongue, and some delirium. On removing the compress, it was found that *the fluid ingesta did not pass through as formerly.* In the course of three days these symptoms subsided, when the fluids again passed through the fistula: soon after she sunk. No dissection was obtained.

This case is fully reported by the writer's friend and pupil, Mr. William Hamilton, in the Lancet of January 28, 1832. He remarks that a fistula thus formed may be closed by inflammation for a time, and hence by analogy it may be concluded that where the intestine is nearly obstructed, it also may become entirely closed by inflammation, and prevent the passage of food; but that, on the subsidence of this inflammation, the passage may be restored.

We shall now briefly examine the question as to whether cancer of the stomach and chronic gastritis are to be considered as identical. In this investigation all the difficulties arise which result from our imperfect knowledge of cancer in general. Supposing that cancer is a new product, and not a mere alteration or transformation of tissue, the question resolves itself into two points:—*first*, does irritation or inflammation, taken in their ordinary acceptation, induce a development of this new matter in the tissues of the stomach? and, *secondly*, may the cancerous matter be deposited independently of any primary irritation, in consequence of a diathesis or disposition of the system at large? In the investigation of the first point we may be assisted by analogy; as for instance, in the case of pulmonary tubercle. That irritation and consequent inflammation does induce this disease in many cases there can be no doubt. How many cases of phthisis commence by a bronchitis; and in what a number of instances are the first symptoms of cancer of the stomach those of a gastritis! In many cases the exciting causes of phthisis are those which would produce inflammation; and the same may be remarked in the case of cancer of the stomach. External cancer is often induced by an injury; and blows on the epigastrium are enumerated among the causes of the internal disease. Why it is that in one case inflammation will induce cancer, and in another not, we cannot explain, any more than why an injury in one person will cause hydatid, in another suppuration, or in a third hypertrophy; or the same morbid influence induce in one continued fever, in another dysentery, and in a third ague.

M. Prus, in his late work on cancer of the stomach, endeavours to draw a distinction between the two diseases, founded more on the exciting causes than on the pathological characters or symptoms of these affections. On this subject he says, "We admit that it is impossible in the actual state of the science to distinguish the organic alterations which constitute a cancer of the stomach from those which are owing to a chronic gastritis." (P. 130.) He also admits that it is impossible to find any distinguishing symptoms between the two diseases, and the indications of treatment which he gives for cancer are essentially those of gastritis; but yet, from the following circumstances, he believes that they are different diseases. He compares the exciting causes of the two affections; but if we extract those of acute gastritis which he has unfairly thrown into the table, we find that they are essentially the same. Those of gastritis are as follow:—suppression of a sanguineous discharge; excess at table; contusions on the epigastrium; repression of gout, rheumatism, or an exanthem; violent passion. Those of cancer are:—depressing passions; abuse of spirituous liquors; excess in venery; contusions of the epigastrium; suppression of a sanguineous discharge. We submit, therefore, that the exciting causes, as given by this author, are almost completely the same, and that they do not warrant his conclusion, that while those of gastritis act by inducing a sanguineous congestion of the stomach, those of cancer act primarily on the nervous system.

M. Prus lays great stress on the occurrence of pain as an almost constant symptom in cancer. Admitting that it was so, it would form no distinction; but the fact is, that it is by no means so constant an occurrence. On this foundation, and on the relief afforded by opiates, he builds his theory that cancer is a result of a neurosis of the stomach, which he calls "*cancerous irritation*," which is not inflammatory, which is not neuralgic, and differs from a neurosis in this slight particular, that it is followed by lesions of secretion and nutrition! This is merely playing on words.

In the present state of the science we must admit that inflammation may induce that state of the stomach called cancer; and there can be no doubt that when the disease is established, there is always more or less of inflammatory action—a fact of great practical importance, no matter whether the inflammation be primary or secondary. But if cancerous matter, like tubercle, be deposited in other situations, without the necessity of previous inflammation, there is no reason why the same should not occasionally occur in the stomach.

Treatment.—The indications of treatment in gastritis generally appear to be as follows:—1. to relieve the inflammation as speedily as possible, so as to prevent disorganization; 2. to avoid everything that can excite or stimulate the stomach; 3. to moderate the sympathetic affections.

Authors are divided in their opinions as to whether general bleeding be proper in acute gastritis. But if the disease be in an early stage, the patient robust, and the pulse resisting, bleeding may always be had recourse to with advantage,—more, however, as a preparative for leeching than as a direct relief of the inflammation. The previous state of health of the patient must also be considered; as, the stronger this has been, the greater will be the benefit from general bleeding. In a weak subject, or in a case where an acute attack supervenes on a chronic gastritis, general bleeding is almost inadmissible.

The great remedy is the application of leeches to the epigastrium, which should be done freely and repeatedly until decided relief is obtained. There are few things more striking in the practice of medicine than the effect of this proceeding in a case of acute gastritis: the vomiting, the burning heat, are often relieved as by a charm; and we have often seen violent cough and delirium subside under the same circumstances. The number of leeches must, of course, be adjusted by the age and strength of the patient, but in this disease injury is more often done from the want than from the excess of leeches. In general, however, gastritis does not require so many leeches as the acute peritonitis. In a robust adult, and where the symptoms are violent, from twenty to forty may be safely applied. In children the number must be regulated by the age. In robust infants four or six may often be applied with safety and benefit. After the leeches fall off, it is better, where it can be done, to apply a cupping-glass, by which more blood is obtained, and the oozing of the leech-bites often prevented, for it is better to apply leeches again than to allow the same quantity of blood to be lost by oozing. This rule is peculiarly true in the case of children, in whom it is right to arrest the hemorrhage as speedily as possible. From these circumstances a poultice should not be applied over the leech-bites in infants, or in adults of a feeble constitution; but in different subjects where the fever is high and pulse strong, this may be found serviceable, where its weight does not distress the patient. The best material for a poultice is linseed meal; and as it must be made thin and light, it will require to be changed every three hours. When its weight and heat excite distress, it will certainly do more harm than good, as the practice is then opposed to the instinctive wish of the patient for cold to the part which has led to the application of ice to the ep* gastrium in cases of violent gastritis, — a practice which is rational, supported by analogy, and recommended by high authority. In these countries, however, it has not yet received a sufficient trial.

The bowels, which are commonly confined, are to be relieved by enemata; but on no account is purgative medicine to be given by the mouth. In using injections, it is better to employ those which are not stimulating, though gently laxative; and it is always right to employ the long gum elastic tube, which will seldom fail in giving great relief.

The patient should inhabit a cool airy room, and be removed from all excitement. Cold drinks, such as pure water, iced water, iced lemonade, may be given ad libitum, and in many cases we have given solid ice in considerable quantity and with decided benefit. The older authors recommended that the drinks in this disease should not be cold, from an apprehension that, as cold drinks sometimes excite inflammation, they would be injurious during its existence; but this reasoning is obviously fallacious. Strict watch must be kept to prevent the attendants giving anything in the shape of a stimulant, whether as food or drink; it is to be recollected that what is innocuous in health may become under these circumstances a deadly poison; for the sensibility of the stomach is so exalted, that the blandest articles will occasionally produce a fatal relapse.

This should be the general outline for the treatment of all cases of acute gastritis. Let the practitioner recollect that all the symptoms proceed from an inflamed state of the stomach, and consequent excitation of its sensibility and sympathies, and avoid the practice of prescribing a medicine for every symptom. Let him combine all his efforts to subdue this inflammation, and do nothing which can possibly interfere with this indication.

Effervescing draughts are commonly used in cases of irritability of the stomach, but in gastritis they often fail altogether in relieving the vomiting; and when this is the case, there is little doubt but that they exasperate the disease. Even when they remain on the stomach, it does not follow that they are beneficial; in several cases they do injury, partly by their direct stimulation, and partly by the mechanical distension of the stomach. They may be used, though with caution, in cases of mild gastro-enteritis, where the disease predominates in the lower portion of the intestine.

In the early stages of the disease, and always where leeches have not been applied, blisters are improper, particularly when applied on the abdomen; in those cases, however, where the disease has followed the retrocession of an exanthem, they are perhaps more admissible. If they are used in the ordinary gastritis, it should be in the advanced stage, and never allowed to remain after pain is excited. (See the article Derivation.)

The use of emetics has been resorted to in the early stages of this disease, but is a practice full of danger. P. Frank declares that an emetic is in general fatal in gastritis; but this perhaps is going too far. In some of the very mild shades of the disease, an emetic may be attended with advantage, and is also useful and indeed necessary when the disease has resulted from an excess at table, and supervened while the stomach was loaded with undigested food. But as a general treatment, we are decidedly opposed to the emetic plan, particularly to the use of antimonials, which are peculiarly injurious when any degree of gastritis exists. The remarks made on the use of purgatives in enteritis (see the article Enteritis) apply nearly to that of emetics in gastritis.

After the violence of the attack is over, and the patient convalescent, the greatest attention is to be paid for a length of time to his regimen. This is of all cases that in which an error in diet is most to be feared; as an excited sensibility of the stomach remains after the inflammation has subsided. Farinaceous substances, with the mildest broth and vegetables, should constitute the patient's food for a considerable period; and if any fixed pain should continue in the region of the stomach, even though the general health and appearance of the patient be improved, the efforts to remove this should be incessant, as it most frequently depends on a circumscribed inflammation, which, if not relieved, may terminate in an incurable ulceration. The means best calculated to remove this symptom are a strict regulation of the regimen, and counter-irritation of the epigastrium.

Facts are still wanting to establish the efficacy of mercury and opium in this disease. From what we know of the stimulating effects of calomel on the gastro-intestinal surface, it seems probable that its use in gastritis would be often injurious, or at least hazardous. It has been said that large doses of calomel have succeeded in arresting obstinate vomiting; but the cessation of a single symptom by no means implies the removal of the disease, or even its alleviation. If ptyalism were speedily induced, we have reason to believe that the result would be favourable; but all practical men know that in a severe inflammation this is a matter of great difficulty or even impossibility, and the chance of our succeeding in the attempt does not warrant any measure that may compromise the safety of the patient. If mercury be used, it should be by inunction.

The treatment of chronic gastritis is founded of course on the same general principles as that of the acute species. It may be considered under two heads—the *curative* and the *palliative* treatment; the first to be adopted in cases where there is a chance of cure; the second where the disease has passed the reach of art. We believe that if there is a disease more frequently mistaken and maltreated than another, it is chronic gastritis. The general practice in this disease is really the opprobrium of medicine, as in the great majority of cases it is not recognised, but considered as a mere functional affection. It is called dyspepsia, hypochondriasis, liver disease, torpor of the biliary organs, constipation; anything but its proper name. The effect of all this is, that almost every attempt at cure in reality exasperates the disease. Bitters, tonics, aromatics, antacids, acids, nervous medicines, iron, arsenic, bismuth, mercury, and purgatives are given in turn; and who can wonder if cancerous ulceration or incurable disease of the solid viscera be the result of such a treatment?

In chronic gastritis the cure is principally to be effected by a long attention to the diet of the patient, which should be as sparing as his strength will allow, and consist of the least possible exciting articles of food. By this simple and physiological mode, by which nature is allowed to exercise her full powers, cures have been performed in cases where great emaciation had occurred, and where the skin had assumed the peculiar hue so characteristic of abdominal disease. Such a result, however, can be rarely hoped for under such circumstances.

We have succeeded in many cases by this mode, and by the repeated application of small numbers of leeches on the epigastrium. The bowels were kept open by injections, and no medicine whatever given by the mouth. In addition to these means, a blister and frictions with the tartar-emetic ointment were employed with decided benefit. In the treatment of this disease we are encouraged to persist in these means from the knowledge that ulcers of the stomach may become cicatrized, and a permanent cure be thus produced. The case of the celebrated Beclard is an interesting example of the effect of a physiological treatment. He was attacked with symptoms of gastritis, which after some time assumed the chronic type. He had then frequent pain, and vomited most of his food; he restricted himself to a severe regimen; occasionally applied leeches, and used the tartar emetic ointment. For a length of time no permanent relief was obtained, but he persisted in his treatment, which ultimately proved successful. After his death, which occurred from a disease of the brain, a cicatrized ulcer was found in the smaller curvature of the stomach; its edges were neither red nor tumefied. The rest of the stomach was healthy.

But are we to believe that tonics should never be employed? Facts are wanting to clear up this question; yet, if we reason from analogy, we should admit that after the disease has been modified by a proper antiphlogistic treatment, such remedies might be applicable. There is at least one case where they seem useful; where, after the prominent signs of disease have been removed, the powers of the stomach do not regain their former strength; but even in this case they are to be used with caution. The great source of injury is the practice of prescribing for symptoms, without connecting these with the pathological state of the viscus; a practice which must always prevail so long as pathology is not more extensively cultivated.

The palliative treatment consists essentially in avoiding over-stimulation, and in the use of the narcotic remedies. Many cases are on record where these have given great relief for a length of time. Those which we have known to answer best are the hydrocyanic acid, and the acetate of morphia. For instances of the efficacy of the narcotic remedies in chronic stomach affections, we would refer in particular to Dr. Bardsley's late work.

In these incurable cases the distressing symptoms of flatus, acidity, &c. must be met by palliatives, as we cannot hope to remove their cause. We beg to refer to the articles INDIGESTION, and STOMACH, ORGANIC DISEASES OF THE, for information on these points.

WILLIAM STOKES.

GASTRODYNIA, from γαστὴρ, ventriculus, the stomach, and ὀδύνη, dolor, pain.

Pain of stomach occurs as a symptom of several diseases. It is often expressed by the term *gastralgia*, but this seems to be used rather in a general sense to denote mere pain of stomach, from whatever cause arising, than as designating any specific malady. Indeed, to comprise under one general head all pains which affect the stomach, would bring together morbid conditions so heterogeneous, or at least so remotely allied, that no advantage could accrue either to nosology or practice from such a combination. Many pains are but symptoms of other diseases, in connection with which they are most appropriately and beneficially discussed. In the present article it is not proposed to treat of all pains of stomach, but principally of one form of such complaint which has long been regarded as an individual disease, and has had a specific character assigned to it in nosological systems, under the denomination prefixed to the present article.

There is a convenience, especially for recording and communicating practical knowledge, in assigning a certain individuality to diseases, designated by brief and comprehensive terms, and so far nosology has its use. But there are also evils attendant on such arrangements which should be kept steadily in view, else they are very liable to mislead, and to divert attention from the only source of real knowledge, the examination of these morbid actions and structural lesions which constitute diseases, and by the minute scrutiny of which alone can we ever acquire just notions of their nature or treatment. A name is not altogether unimportant; for if not founded on the essential derangement, but derived from a contingent symptom, it conveys a false notion, which, to the young and inexperienced at least, is not harmless, tending to contract their views at that period of life when the spirit of inquiry is most active, and very likely to give a bias to their maturer judgment. Early impressions sink deep: early experience being directed by them is apt to confirm them; the active business of life does not always afford time or opportunity for investigating or correcting fundamental misconceptions; and thus a prejudice, engendered by a mere name at the commencement of professional life, may endure to its close. The history of physic affords abundant evidence how tardily early prejudices and misconceptions yield to the force even of demonstrative proof; of which the reception which Hervey's discoveries met from his contemporaries may be adduced in illustration.

Pain of stomach is not properly a disease, but a symptom attending diseases which have their seat in the stomach, or which sympathetically affect it. The evil of regarding the pain as identical with the disease, is that, on this presumption, whatever has the power of allaying the pain must be deemed the appropriate remedy for the disease; an error which has given rise to much mischief, and which more extended investigation of the real nature of the disease fully exposes.

Nevertheless, in the present state of our knowledge, we must follow the denominations of diseases generally received, and no injury need result so long as the name is not suffered to decide the pathological character, nor to repress inquiry into those morbid actions or conditions to which remedies, to be effectual, must be directed.

The pain of stomach, which is the main subject of the present article, is generally regarded as a mere symptom of dyspepsia. Its great prevalence, however, the suffering which it causes, the interruption of healthy function which it indicates, its long durations, and the structural derangements that may ensue from erroneous or inefficient treatment, entitle it to a separate and independent consideration.

In Cullen's nosology gastrodynia has no place, save as a symptom of dyspepsia. Sauvages and Sagar, who regarded it as a distinct and specific malady, have each distinguished it by a definition; that of Sauvage, as "quicunque dolor notabilis et constans in regione ventriculi, qui continua animi dejectione non stipatur ut cardialgia, nec pyrexia ut gastritis." Sagar's, though more brief, is similar; "notabilis et durans in regione ventriculi dolor, sine syncope et pyrexia."

Persons affected with this malady evince generally more or less of dyspeptic derangement. The sense of pain, however, overpowers every other feeling, and is represented as the sole complaint; the contigument ailments being acknowledged only on inquiry being pursued. So variable is the pain, both in intensity and duration, that it would be difficult to furnish a description which would comprise all its gradations. It is characterized as an obtuse pain, giving the sensation of the stomach being forcibly compressed. There is oftentimes tenderness on pressure at the ensiform cartilage, a sense of stricture across the lower part of the chest, with pain extending to the back, and impeded respiration; all marking the diaphragm to be implicated. In general the pain occurs more particularly at certain times of the day, lasts for some hours, and subsides. These attacks are more or less frequent, more or less durable. Sometimes the intervals of abatement are so inconsiderable, that the pain is represented as lasting all day, although on inquiry the usual remissions will be found to have occurred. The disease is oftentimes met with unattended by any other indication of impaired health, the pulse being calm, the skin cool, and the tongue clean. Generally the tongue is more or less loaded; and in some a quick pulse and hot skin mark the co-existence of a febrile state. This last condition is not a frequent concomitant, and may be regarded as accidental, not being necessarily produced by or connected with the primary affection; yet it may have relation to the mucous membrane of the stomach passing into a state of inflammation, as will be hereafter noticed. The spasmodic character of the pain and the absence of fever have misled practitioners into much inefficient and injurious practice in this complaint. Stimulants, narcotics, and other antispasmodics have been freely given; yet notwithstanding the power which such remedies unquestionably possess of allaying the pain, there is good reason to believe that their use is not suitable for the cure of the disease, — nay, that however they may temporarily alleviate, they, if solely relied on, tend in reality to confirm it, and render it more inveterate.

If the views of the malady about to be presented in this brief essay be correct, — and they are the result of slight observation, but of extensive experience in this special disease, which prevails much among the poor, — the use of such remedies must be superseded by more rational and effective treatment.

The brief account already given of this disease is almost enough to characterize it. In the commencement the pain is generally slight and transient. Accompanied, as it frequently is, with flatulency, this is conceived the cause of pain; and as cordials and carminatives give relief, they are chiefly resorted to. Warm purgatives are apt to be employed; and as they both stimulate the stomach and evacuate it downwards, they are still more beneficial. Unless the disease, however, be very slight indeed, these remedies are inadequate to afford effectual relief. In time the attacks of pain recur more frequently, are more violent, and of longer duration. In this stage it is that opium, ether, and such remedies are resorted to; and as they have the power to lull the pain, their appropriateness is seldom questioned. On recurring attacks they are again employed, and with greater freedom; for the more such remedies are used, the larger must the doses be to produce the required effect. Thus recurring and thus treated, the disease leads in time to a variety of derangements, both visceral and nervous. Digestion becomes progressively more depraved, nutrition fails, and the body wastes; the strength declines, and the patient eventually sinks from exhausted constitution, if his fate be not hastened by some coincident or superinduced disease. Very different is the result when the early disease is treated on principles deduced from its real nature, and from that condition of stomach in which it originates.

So obviously spasmodic is the pain of gastrodynia, that, the real nature of the disease being unsuspected, it is not surprising that it should be regarded as essentially spasmodic, or that antispasmodic remedies should have been trusted to for its relief. The alleviation of pain, too, obtained by stimulants and narcotics, was well calculated to confirm the prevailing notions, and establish the practice founded on them, as the most judicious that could be employed. Yet admitting the existence of spasm, it surely merited inquiry why this spasm should occur, and what causes could excite it. That the muscular coat of the stomach should be affected to this extent by any primary depravation of its own fibres was at least not probable, the supposition being inconsistent with the general state of health, which, in the outset at least of the disease, persons affected with gastrodynia ordinarily display. Some special irritation ought to have been suspected, and had this been sought in the condition of the mucous membrane of the stomach, and of its secretions, it could not long have eluded detection.

That in gastrodynia the mucous secretions of the stomach are redundant and unhealthy is sufficiently demonstrable. If emetics be given, this mucus is copiously discharged, of a quality to show that it was not of recent formation. Instead of being fluid and pellucid, it is dense, membranous, and opaque, unlike in all respects to that which a healthy stomach discharges on the operation of an emetic. The difficulty, too, which the stomach experiences in detaching and expelling it is proportionally great, and the effort is oftentimes severe. The stools also are loaded with mucus, to which a corresponding state of the mucous membrane of the intestines no doubt contributes. The presence of this mucus evinces a previous excitement of the membrane secreting it, and in this irritation we may reasonably conceive the primary disease to exist. It is only, however, when the mucus thus formed accumulates and oppresses the stomach, that the spasmodic pain occurs; and when the foregoing facts are considered, in conjunction with the relief which suitable evacuants afford, it is difficult to resist the conclusion that the pain arises from a contractile effort of the stomach to detach and expel the offending matter. This view may be deemed conjectural, and in some respect it is so, resting for its truth rather on inference than demonstration; for as gastrodynia, at least in its earlier stages, does not destroy life, necroscopic observation, even if it could detect such morbid condition, cannot be referred to in proof of the lesions thus supposed. Yet it is a rational conjecture, and fully supported by all that we know both of the physiological nature of the parts concerned, of the phenomena of the disease, and of the effects of medical treatment. But we are not without direct evidences of the morbid condition of the mucous membrane here inferred, although they are not connected with the disease under consideration so as to make them available for directly illustrating it. All pathological anatomists, who have investigated minutely the lesions of the gastro-intestinal mucous membrane, bear ample testimony both to the frequency of vascular congestion, and to the abundant mucus connected with it. In respect of the latter, Andral says, "on opening dead bodies one is sometimes struck with the prodigious quantity of mucus on the internal surface of the stomach and intestines." Again he remarks, "we find vomiting produced by all possible degrees of irritation of the gastric mucous membrane, which cause the patient to throw up food and drink, or else the bile which had previously been attracted by the irritation of the stomach. In other cases the matter vomited consists of blood exuded by the irritated mucous membrane, or of mucus secreted in superabundant quantity, which last by accumulating becomes a kind of foreign body, and produces by its presence secondary irritation more considerable than that to which it owed its existence." The vascular congestion has been distinguished as existing in the capillaries, in the larger vessels leading to them, or to both. The hyperaemia of the capillaries is regarded as arising exclusively from irritation; and as these pervade the mucous follicles, and are in fact the source from whence mucus is secreted, there seems to be little difficulty in perceiving how irritation must almost of necessity beget an increased secretion of mucus.

If then, as appears, irritation occasions increased secretion of mucus, and if this mucus is capable of accumulating and of becoming a kind of foreign body, producing by its presence a secondary irritation more considerable than that to which it owed its existence, we have the elements of that pathology which long and patient observation of the effects of medical treatment has led us to assign to gastrodynia. What the precise affection is to which French practitioners give the name of "embarras gastrique" we are not aware, but many circumstances in the following extract from Andral, show that it is nearly allied to that morbid condition of stomach which prevails in gastrodynia, and of which spasmodic pain is only a contingent symptom.

"There is a peculiar morbid state of the stomach that has long been distinguished by French practitioners by the name of 'embarras gastrique,' the nature of which is far from being well known. It is characterized by a certain assemblage of symptoms local and general, does not yield at all to bloodletting, and but slowly to diet, while it readily gives way to emetics and purgatives. That the symptoms which attend this affection are often connected with irritation of the stomach, and that they are exasperated by tartar-emetic, has been proved by experience; but that it is in every instance merely gastritis, and not a disease of another kind, and requiring a mode of treatment as peculiar as the symptoms that announce it, is a conclusion totally incompatible with observation. It may be presumed that one of the causes of the affection is an alteration of the mucous secretion of the stomach, and I do not see why such an alteration should be considered as necessarily the result of irritation, unless we choose to allow that the mucous coating which sometimes covers the tongue necessarily indicates glossitis." It is clear that the term irritation in the foregoing passage is used to express, not the simple irritation which merely excites increased secretion, but the more active state into which this occasionally passes, and which, when advanced to inflammatory action, constitutes gastritis.

From the foregoing discussion it will, we think, be admitted that the researches of pathological anatomy are at least not opposed to that pathology of gastrodynia which assigns the spasmodic pain to the presence of offending mucus, and the efforts of the stomach to get rid of it. Irritation is no doubt the primary affection that leads to increased secretion of mucus, but it is to the secondary irritation caused by this mucus when redundant and accumulated, and to the efforts which the stomach thus exerted makes to throw off into its cavity what offends it, that the peculiar pain of gastrodynia must be referred. The spasmodic nature of these efforts accounts for the alleviation of pain produced by opium and stimulants, and the cause not being thus removed, we at once understand why such relief is but transient and ineffectual. The perfect relief desirable from suitable evacuants, without any aid whatever being required from narcotics, proves unequivocally how much more concerned the offending matter is in causing the pain, than is the muscular coat of the stomach which this matter so grievously disturbs, and which needs only to be freed from the disturbance to return at once to healthful quiescence, and, if the primary irritation have ceased to operate, to that ordinary exercise of functions which in health is so tranquil as not to be a subject even of consciousness.

On these principles, then, the cure of gastrodynia requires that the mucous membrane be freed from the redundant secretion with which it is loaded and oppressed, and that a healthful state of the secreting membrane be established so as to guard against renewed accumulation. And here it may be remarked that accomplishing the former purpose ministers to the latter; for when the accumulated mucus is dislodged by suitable evacuants, not only is a direct source of irritation removed, but the secreting organs are restored to a more effective exercise of their functions, by which the primary irritation, and the congestion consequent to it, are best and most effectually relieved. The effect of irritation is congestion of blood-vessels with hyperæmia of the capillaries, and these beget increased secretion from the mucous follicles, by which the overcharged vessels are unloaded, and the natural cure of the disease effected. When these conditions and natural changes are clearly understood, the treatment of the disease becomes simple in the extreme; and if the success of others in treating the malady on the principles here inculcated but equal what the writer of this essay almost daily witnesses, he will have little apprehension either of the pathology here advanced being rejected, or of the practice enjoined being condemned.

It may throw some light on the subject, to consider the circumstances which tend to excite and vitiate the gastric secretions so as to induce this form of disease. Though luxurious living is a fruitful source of gastric disturbance, yet gastrodynia is not the most frequent consequence of such indulgence. Much more generally does the disease assail the poor and ill-fed, amongst whom it is very prevalent. How far it is caused in them by poverty of diet or by abuse of stimulants, it would be difficult to determine. Our own impression is that the former cause is most influential. A poor vegetable diet, when taken for a constancy under circumstances that would demand food of more nutritive quality, weakens digestion, as is evidenced by flatulency, acid eructations, heartburn, and other dyspeptic manifestations. Whether as cause or consequence of these disturbances, irritation of the mucous membrane may be presumed to exist. We have seen that irritation begets hyperæmia of the capillaries; that this leads to increased secretion of mucus; that this mucus is capable of accumulating and of acting as a foreign body, inducing a secondary irritation; and that it is this secondary irritation which is the most probable exciting cause of that spasmodic pain which characterizes gastrodynia. Deficiency of food may be readily conceived to produce similar effects. However this be, (for we contend not for the conjectural expositions thus hazarded) the important fact is, that in gastrodynia the mucous secretions of the stomach are redundant and depraved, and that the removal of this offending matter, and the re-establishment of moderate and healthy secretion, are the essential means of cure. It may be objected that the evidences of redundant mucus are not always demonstrable; that the practice resulting from this theory is often inapplicable if not injurious; that remedies very different from those which we enjoin succeed in giving relief. To these representations we would reply, that if the causes assigned be proved to exist in the more exquisitely-formed cases, a fair analogy justifies an extension of the same reasoning to the slighter shades of the same malady,—that the term pain of stomach is so vaguely applied, that the most opposite conditions of that organ are incongruously classed together under it, to all of which the same treatment cannot be suitable,—and that when remedies the opposite of those which we enjoin succeed best, the disease will on investigation be found to be of a character very different from that which belongs to the subject of this essay. We are aware that pain attends a state of stomach marked by high irritability, sickness, vomiting, with other corresponding symptoms; and that this is best relieved by soothing remedies, and often by the suspension of all irritation, perfect abstinence being often the best of all remedies. Castor-oil as an aperient, cooling salines, prussic acid, will here give relief, when drastic purges or cordial remedies would exasperate. But this disease is essentially different from the one now treated of: it is acute, while pure gastrodynia is chronic. The pain is continuous, while that of gastrodynia occurs in paroxysms. Its consideration, therefore, belongs rather to the head of gastritis than of the disease now under discussion.

The reference to a poor vegetable diet, and to a deficiency of nutriment, as giving rise to that condition of stomach which produces gastrodynia, would serve to explain why this disease among the poor is in general so little liable to pass into inflammation, and also why the combination of cordial remedies with purgatives is still so eminently serviceable. The supposition, however, of vegetable food being unsuited to dyspeptic ailments is often egregiously misapplied when these occur among the higher classes of society. Such patients are continually enjoined to live almost exclusively on animal diet, all vegetable matter being interdicted as if it were poisonous. This is a great misconception, for if a due admixture of vegetable food with animal be not borne by the stomach, there is always something to correct which no precision of mere diet will ever thoroughly rectify, while an exclusive use of animal food begets evil far more serious than any to which mere dyspepsia can ever give rise. A brief case may illustrate this. A delicate female suffered long from what was called weak stomach, and was enjoined an animal diet, all vegetables being prohibited. Experiencing some relief, she pursued this system until increasing plethora induced determination of blood to the head, ending in violent epilepsy. By active discipline this was relieved, and it afterwards became necessary to restrict the animal diet and return to vegetable. The stomach, improved by the depletion and other evacuant treatment required for the epilepsy, now bore vegetable food without inconvenience, and in getting rid of her epilepsy she became released also from her dyspepsia. In gastric derangements, therefore, the general state of constitution should be regarded no less than the local ailments. If plethoric, depletion with low diet will be most suitable; if low and impoverished, depletion will of course be improper, save the evacuations which the special derangement may require; and sustenance must be more liberally allowed. It is of importance, however, that no mistake be committed in this respect, and that the deceptive feebleness which frequently attends and results from a plethoric state of constitution, be not confounded with pure debility arising from insufficient nutriment; of which subject a full elucidation will be found under the article Plethora.

As evacuation of the stomach and bowels by suitable purgatives forms an essential part of the treatment of gastrodynia, it becomes expedient to offer here a few remarks on the differences of operation observable among purgative medicines, as a guide to the judicious selection and adaptation of them to the cure of this complaint.

In considering the operation of cathartics, it is necessary to bear in mind that the stomach forms part of the alimentary canal, and that, although emetics are its more immediate evacuants, it both requires to be cleansed, and admits of being so by means of suitable cathartic medicines. In the operation both of emetics and purgatives some well-marked differences are respectively distinguishable. Of emetics, some merely eject the floating contents of the stomach, while others cause it to throw off also its mucous secretions. Examination of the matter discharged by vomiting furnishes abundant evidence of the fact. In the operation of purgatives there is a still greater variety; and these, though divided generally into cathartica mitiora and acriora, or laxatives and purgatives, seem to admit without violence of still further distinctions. Some merely carry forward the foul contents, gently exciting the peristaltic motion of the intestines, and thus emulating the natural processes; others, in addition, act on the exhalent arteries, producing copious watery stools; and a third class, while they expel fæces, and are capable of producing liquid stools, have the further power of emulging the follicles which line the mucous membrane, causing them to throw off the redundant secretion which adheres to and oppresses them. When the bowels are merely inactive, their secretions healthy, and no constitutional disease present, simple aperients of the first sort suffice to obviate costiveness, and prevent fæculent accumulations; medicines of the second are necessary when, besides unloading the bowels, it is required to allay fever and abate arterial action by reducing the volume of the circulating fluids; those of the third are called for when, in consequence of increased action in the vascular system, or of special irritation, the natural mucus of the stomach and intestines is inordinately secreted, or when it becomes viscid and of morbid character, so as, by its special irritation, to give rise to or aggravate disease.

The special medicines belonging to each class will naturally suggest themselves to every practitioner. A precise arrangement of them on the principle here noticed is not required, and would serve no useful purpose. The same medicines act differently on different constitutions, and it is to the effect rather than to the medicine producing it, that attention should be directed. Castor-oil, sulphur, manna, and such like, are medicines of the first class; to the second, chiefly, the saline aperients are to be referred; and to the third various vegetable cathartics, such as aloes, colocynth, jalap, &c., variously combined with each other, and, as occasion requires, with certain metallic salts and oxides, which powerfully aid their operation. These salts and oxides are principally of antimony and mercury, which in their effects on the gastro-intestinal mucous membrane differ more in degree than in kind; each, while it affects more particularly one part of the canal, being capable of exerting its influence on the whole. Thus tartarised antimony, the more immediate effect of which is to excite vomiting, with discharge of mucus from the stomach, is also well known to purge; and calomel, chiefly used, when given with cathartics, to increase their purgative effect, often excites sickness, and vomiting. These facts are important for guiding us to a discriminating use of purgatives in the cure of gastrodynia.

The spasmodic pain of this disease being traceable to the irritation caused by redundant and vitiated mucus, and the discharge of this proving the most effectual means of relief, it is obvious that to whatever antecedent deviation from health its production may be owing, the first indication is to effect its removal by well-adopted evacuants. Various auxiliary remedies are no doubt valuable, and of these several will be noticed; but it cannot be too deeply impressed that unless the main object of removing the offending cause be accomplished, all means which act merely by allaying pain must prove of transitory effect, if not wholly abortive. And here we may cursorily remark, that however the practice inculcated in this essay may seem to flow from the theory proposed, it was not originally derived from it; on the contrary, it was from the signal success of the practice, with close and patient observation both of the phenomena of the disease and the effect of remedies, that the theory was deduced. From the pathology advanced, it might seem to follow that emetics, and especially those which dislodge the mucous secretions of the stomach, would be the direct and appropriate means of cure. Such remedies are no doubt applicable, but in the larger portion of such cases milder treatment will fully suffice. Besides, though pain of stomach is the prominent symptom, disease is not confined to the viscus, but extends along the intestinal tube, the secretions of which evince a state of vitiation corresponding to that of the stomach, whence a necessity exists for cleansing not only the stomach but the whole intestinal canal; and this is most effectually done by combining remedies which are capable of acting on every part of it. The combination which effects this purpose most completely is colocynth, or any similar drug, united with calomel and tartarised antimony in due proportion. After what has been said, the rationale of its opetion can need no further explanation.

In the form and degree in which the disease ordinarily presents itself, very mild treatment suffices to remove it; yet if this be not employed, it may continue to harass the sufferer for months or years. A few active purges, of colocynth and calomel, with or without the addition of antimony, cleanse the stomach and bowels, while mild cordials given in the intervals relieve flatulency and abate uneasy feelings.

In hundreds of cases treated at the Bath United Hospital, the common cathartic pill of the house (composed of four grains of colocynth and one of calomel), and a form of cordial mixture which has been in use there for half a century, are the only remedies required; and by means of this simple treatment relief is afforded almost uniformly, and within a very short time. At first the stools are almost always dark, foul, and slimy; and it is interesting to observe how improvement of stools and decline of symptoms keep pace with each other. So long as the stools continue foul, the disease does not thoroughly yield, nor can the use of remedies be relinquished; and it is of importance to attend to this connection, for if consciousness of recovery induce the patient to forego the use of medicines ere healthy stools be re-established, either renewed disease or impaired general health will inflict the penalty of his precipitancy.

We are no advocates for the continued use of medicines however mild, but much experience has satisfied us that until a state of healthy secretion be established in the intestines, especially after long derangement of their functions, there is hazard in foregoing the assistance which nature requires. Two of the cathartic pills above mentioned, taken every other night or twice a week, operate in general as much as is needed. But such patients are frequently so costive as to have no stools but by means of the pills, and need aperients in the intervals. For this purpose the common black draught may be given; but when such costiveness prevails, it becomes expedient, after a few doses of colocynth and calomel, to give every night, or night and morning if necessary, colocynth, aloetic pill, or any corresponding aperient, to the necessary extent. An excellent combination for this purpose is colocynth conjoined with henbane; two parts of the former to one of the latter. While the purgative treatment is pursued, much relief is afforded by the daily use of the cordial mixture already noticed; and so valuable has this been found as an adjuvant, that it may not be amiss to give here its precise formula. It is the *mistura salina cardiaca* of the hospital pharmacopœia. By whom it was introduced we have been unable to trace, but it has been in constant and extensive use for upwards of half a century; and though the simplicity and apparent inertness of the compound may excite a smile, we can faithfully declare that we know not a more valuable adjuvant wherever purging, such as we have described as necessary in gastrodynia, is required for the correction of intestinal derangements. It is valuable, too, in many other disturbances of gastric and intestinal functions, which it would be foreign to our present purpose to discuss. The mixture is thus prepared:—

℞ Sodæ subcarbonatis, ʒiss.
Aquæ puræ, Oviiss.
Acidi sulphurici diluti, ℥i.
Confectionis aromatici, ℥iii.
Spiritus menthæ piperitæ, ʒiii.

The foregoing quantities, thus combined, yield 324 grains of sulphate of soda, 423 grains of the subcarbonate remaining unaffected by the acid. Thus each ounce of the mixture contains but a few grains of either salt; yet, insignificant as the dose may appear, it is not inert. It is very possible that practitioners often err, especially in the treatment of chronic maladies, from requiring an obvious effect from each dose administered; and that where it is ascertained that a medicine actually possesses inherent powers, the slow and almost imperceptible exercise of these powers should not be despised. There is often more wisdom in seconding the efforts of nature than in superseding them. When offending matter is to be removed, which the natural efforts, if unassisted, are unable to expel, adequate means must be employed, and evidences of effective operation required; but in restoring the weakened secretory organs to more healthy action, perhaps the gentle agency of the mistura cardiaca may accomplish what more distinguished tonics fail to effect. We have given the formula chiefly to illustrate the treatment which we recommend, without any prejudice in favour either of the ingredients or proportions. If the principle be admitted, each practitioner may employ whatever form of cordial medicine his own experience may lead him to prefer; the object of the present work being not to lay down arbitrary rules, nor prescribe specific remedies, but to guide the young practitioner by elucidating the pathology of the several diseased conditions treated of, and establishing the principles on which rational treatment should be pursued.

So prompt and effectual is the relief afforded by the foregoing treatment in common gastrodynia, that opium and strong stimulants are never needed. It has been shown that, as these have no effect in removing or correcting the cause of disease, they are not the appropriate means of cure; and in this respect practice and experience fully confirm what theory would dictate. Indeed, they are not only unsuited to the cure, but when exclusively relied on, they tend to aggravate the disease and render it inveterate. The pain arises from contractile efforts of muscular fibres forcibly exerted. These are excited by the morbid mucus with which the stomach is coated, and their tendency is to throw off the offending matter. To repress the effort by narcotics or overcome it by stimulants, leaving the offending cause unremoved, is not rational practice; while the effect of such remedies immediately on the secerning membrane is to confirm the morbid actions by which the secretions had become depraved, thus adding to the evil and rendering its ultimate correction only the more difficult. All this may be deficient in proof, but it accords with all that the most successful treatment of the disease teaches. When opium is trusted to for subduing the pain of gastrodynia, we have already said, that by frequent recurrence to it, increasing doses become requisite in order to produce the desired effect. A habit is thus acquired of pernicious tendency, and under which the whole constitution is sure to decline. The extent to which opium has been administered for this purpose has been often enormous. An old and experienced physician once told us with much self-complacency, that he had just given laudanum, in full doses, quickly repeated, to the extent of two hundred and sixty drops, to relieve pain of stomach; and if the remedy had been appropriate, he would have been right in disregarding quantity, the effect, not the dose, being the object most important. But denying as we do the principle, we must condemn the practice as both empirical and injudicious. Cases may, no doubt, occur of such intense suffering as to demand full doses of opium for prompt relief; but they must be very rare, for in a wide field of hospital practice, in which gastric derangements abound, we never meet with them. Were such a case to present itself, we should have no objection to give a full dose of opium, combined with calomel and antimony; but we would as soon as possible resort to that treatment by which alone, according to our views, the disease can ever be effectually relieved.

The patients who apply to the Bath United Hospital on account of gastrodynia have some of them suffered for weeks, months, nay years. It could not be expected that all would be relieved with equal ease, and yet the difference in this respect is much less than might be imagined. Although in recent cases removal of the cause at once arrests the spasmodic efforts which occasion the pain, it does not follow that it should succeed with equal promptitude where from long continuance the spasmodic efforts have acquired the additional force of habit; and accordingly it happens that the pain sometimes lingers even after a healthy state of bowels has been re-established. This state affords opportunity for proving the relative efficacy of auxiliary remedies. Of these the most powerful of all that we have tried is the oxide of bismuth, [Bismuthi subnitras of the Pharmacopœia of the United States,] though how it acts we are ignorant, our use of it being purely empirical. In the dose of five grains, with one of aloes, given three times a day in conjunction with the cordial mixture, it rarely fails in this stage of the disease to give relief. In some cases spirit of ammonia is a useful addition to the mixture. A combination of equal parts of the cordial mixture and camphor julap furnishes a modification which agrees with many, especially when, as occasionally happens, hypochondriacal depression attends. Blisters to the scrobiculus often render essential aid in protracted cases. In obstinate cases we have often given purges of oleum terebinthinæ, either alone or combined with oleum ricini, and with sensible advantage, being led so to employ it from having witnessed its efficacy in improving the stomach where tænia had been suspected, but where no worm was found. A remedy of this kind, however, is rarely needed. All that has yet been said applies solely to simple gastrodynia, and for its full and effectual relief we believe the treatment enjoined to be amply sufficient. If the principles, however, which we advocate be confirmed by more extended experience, individual practitioners may modify the treatment, both direct and accessory, in whatever way their judgments may direct.

It is not our province to discuss here the more formidable maladies of which pain of stomach is but a symptom, such as schirrhus, cancer, ulceration, &c. One contingent ailment only, connected occasionally with gastrodynia, shall we here notice. Simple gastrodynia is a chronic disease, being unattended with fever or acute symptoms of any kind. Occasionally, although spasmodic pain of stomach be the chief complaint expressed, acute symptoms are seen to attend. The pulse is quick, the tongue is white, the heat of the skin is greater than natural, and there is pain on pressure at the scrobiculus. These symptoms mark inflammatory action, which calls for its proper treatment. Venesection may here be needed; cupping or leeches over the stomach are always proper; blisters, too, may be required. The purgative formerly recommended may here seem unsuitable, yet we have not experienced any objection to its use. Should it cause pain or increase irritation, a milder should of course be substituted. If inflammation be very acute, the proper treatment of gastritis should be employed, and perfect abstinence may be advisable; but this activity of disease we have not witnessed as contingent to gastrodynia. While inflammatory symptoms continue, it is advisable to forego the mistura cardiaca for one more cooling and febrifuge. Any form of antimonial saline may answer, or, what is still better if the bowels be tardy, a solution of epsom-salt in rose infusion, which will often lie on the stomach, even when simple diluents are rejected. When the inflammatory symptoms subside, the cordial mixture may be renewed with advantage. And here it may not be amiss to inquire how it is that cordial remedies are at all applicable under such circumstances, when every degree of excitement would appear incompatible. The fact that they are borne, and with advantage, is too well established to be set aside or referred to misconception, and in the researches of pathological anatomy a rational exposition may perhaps be found. Andral, in pointing out the lesions of the gastro-intestinal mucous membrane, having shown that hyperæmia of it may be divided into three heads, as it is situated in the capillaries particularly, in both capillaries and larger vessels, or in the larger vessels only, thus proceeds: "Of these three kinds, the first belongs almost exclusively to a state of irritation, and is an almost certain proof of its existence; the second belongs equally to a state of irritation and to a state of congestion, from a mechanical cause that has acted during life or after death; the third but rarely depends on the last cause, but yet neither does it announce a state of irritation similar to that which produces a hyperæmia of the capillaries only. In fact, when the congestion is thus confined to some of the tolerably large vessels that are distributed under the gastro-intestinal mucous membrane, we have reason to think it belongs to a state of irritation that is on the decline, and we may even admit that in such cases all irritative process has completely disappeared, and that the blood, which is still accumulated in some vessels, appears there only because these vessels, having been distended by the unusual quantity of blood that traversed them as long as the irritation continued, remain passively dilated after all irritation has disappeared. This is what often takes place in the mucous membrane of the eye, in which, long after the capillaries of the conjunctiva have ceased to admit blood, some larger red vessels still continue to appear on that membrane. It there frequently happens that by applying substances of a more or less stimulant nature to the conjunctiva, these vessels are forced to resume their natural dimensions, and to get rid of the blood which constantly tends to dilate them. *May not this help to account for the success which sometimes attends a tonic mode of treatment when employed towards the end of certain kinds of irritation of the alimentary canal?*" The quotation is so apposite to the subject under discussion, that, however long, we can need no excuse for thus introducing it.

It may, perhaps, be surmised that we ought to have adduced authorities in support of the opinions which we advance; but, in truth, we know not where any exist that would have suited our purpose, which, as being that of the work for which we write, is to furnish a safe and rational guide to the inexperienced practitioner. To glean from all who have treated of stomach complaints would swell this article to a cumbrous extent, and be, as we conceive, unprofitable. What we have stated, we faithfully believe to be true; and as the views which we here present are not to be found in practical works, even the most modern, we conceive that we best discharge the duty allotted us by giving them as our own judgment and experience dictate, without diverging into controversial comments, or the equally unsatisfactory practice of advancing what we could not vouch for as true.

Dr. Cullen, in discussing dyspepsia, dismisses the treatment of gastrodynia in a single sentence, merely stating that it may be sometimes relieved by carminatives, but most certainly by opiates. Dr. Darwin, while he distinguishes cardialgia as a specific disease, assigns no place in his nosological arrangement to gastrodynia. Dr. Mason Good, too, our latest projector of a methodic nosology, has seen reason for separating cardialgia from dyspepsia, and considering it a distinct disease, but he has not so distinguished gastrodynia. Dr. Heberden, the most purely practical of modern authors, attempts no pathology of the disease. He recites various influences by which it is affected, but concludes with saying, "modo profuerunt, modo nocuerunt, et interdum fuerunt supervacua." For simple gastrodynia he recommends Bath waters, bitter and aromatic powders or infusions, with rhubarb or aloe to move the bowels, and some aromatic tincture to be taken after dinner. In fine, Dr. Abercrombie, the latest and best of our practical writers on gastric complaints, in his valuable Researches on Diseases of the Stomach, &c. takes due notice of gastrodynia, and points out some important differences in the forms which it assumes, with conjectures on their respective nature. Still not having facts on which to found a rational pathology, he attempts none; and with regard to practice his words are, "It is difficult to say what remedies are best adapted to each of these forms of gastrodynia." As the result of his own experience, he recommends sulphate of iron, combined with aloe and aromatic powder, oxide of bismuth and rhubarb, lime-water and small doses of opiates, and in obstinate cases, bleeding, blistering, and farinaceous diet. It thus appears that the subject of gastrodynia required further investigation, and that a more discriminating practice in the treatment of it was greatly needed. How far the present essay contributes to supply the want, time and the experience of others must determine. We can only say that we have not presumed to put forward crude speculations or mere conjectures, but solely what we regard as practical truths. Sixteen years ago we published in the Edinburgh Medical and Surgical Journal similar views of this disease, in an essay entitled Pathological and Practical Observations; and in the interval which has since elapsed, we have seen nothing to alter materially the opinions then expressed; their truth being, to our conviction at least, fully proved by the uniform experience of an extensive hospital practice, in which gastric derangements particularly prevail.

[In various forms of neuropathic disorder of the stomach, in which gastrodynia is a leading symptom, hydrocyanic acid, given in the dose of one drop three times a day, has been found of marked efficacy. Creasote has been prescribed in similar cases; and, where neither hydrocyanic acid nor creasote has succeeded in affording relief, it has been advised to give them in combination. In cases of gastrodynia, which have appeared to proceed from morbid irritability of the nerves of the stomach, nux vomica and strychnia—a grain of the former, or a sixteenth of a grain of the latter three times a day—have been strongly recommended.]

E. Barlow.

GASTRO-ENTERITIS. — [*Gastro-enteric Disease*, Copland, *Dict. Practical Medicine.*] In the articles Enteritis and Gastritis, we have given a succinct description of the effects of inflammatory disease on the different portions of the digestive tube, and of the consequences of this disease on the functions of the system generally. We have also endeavoured to show that the coexistence of inflammation in the stomach and in the remainder of the tube is not so universal as to form a law in pathology; so that, in the actual state of medicine, the following proposition of Broussais cannot be adopted:—"L'inflammation de la membrane interne ou muqueuse de l'estomac s'appelle *gastrite*; mais elle n'est jamais vérifiée sur le cadavre qu'avec celle de la muqueuse des intestins grêles. Il faut donc mieux lui donner le nom de *gastro-enterite*." (*Broussais*, Commentaires des Propositions de Pathologie, cxxx.)

Yet it is true that in most of the cases where inflammation either in its primary or secondary form is met with in the digestive tube it occurs both in the stomach and in some part of the intestines. This we have verified by numerous observations, and it is more particularly to be observed in the diseases of the gastro-intestinal tube which occur in fever, and in many other cases where a typhoid state exists.

It is a fact, and we state it with regret, that the pathology of the digestive system is far from being generally understood in these countries. In consequence of this, a mode of practice disgraceful to science, and productive of the most extensive injury to human life, has been too generally adopted. In many instances,—indeed as a matter of daily, hourly occurrence,—practitioners appear to forget the existence of such an organ as the gastro-intestinal mucous membrane, and many a life is in consequence sacrificed to empiricism, to wilful prejudice, or to ignorance. Several causes have concurred to produce this state of things. Of these we may mention the following as principal: —the excessive importance which has been long attached to alterations of the liver; the spread of the doctrines of Hamilton, so popular to many minds from this, that under the name of science was put forward an empiricism easy in its application though destructive in its results, and saving the trouble of thinking and the necessity of study; the works of Abernethy, in which, though approaching to the truth, this great man did not wholly divest himself of the prejudices imbibed by education. But we believe that there is another source, the effects of which should form a warning to all medical writers. The great facts connected with this subject, contained in the writings of Broussais, and which he was the first to proclaim to the medical world, have been received with distrust, because they were appealed to as the support of doctrines which were not found to stand the test of observation; and thus, in the rejection of the theory, have the facts been disregarded. But if the French school has gone too far, and assumed, in its generalizations, more than their facts would warrant, the British school has been culpable in rejecting those results of observation of which the ardent minds of our neighbours have made an unwarrantable use. Under such circumstances, then, how careful should a writer be! for thus not only may his own reputation suffer, but mankind be deprived, for a time, of the most valuable knowledge.

We have already alluded to the great frequency of inflammations of the digestive tube. When we take this fact into consideration, and recollect that from the singular sympathies of the digestive system, a very slight disease may produce severe effects on the economy, the importance of the investigation becomes evident. Let us compare, in the latter respect, the gastro-intestinal surface with the bronchial mucous membrane. In this last an extensive inflammation may exist, and yet without producing a tithe of the morbid effects on the economy which a much more circumscribed and slight gastro-enteritis will induce. In the case of serous inflammations, also, we see another example of the superiority of the sympathies of the digestive over those of the respiratory system. A pleuritis, as compared with a peritonitis, is a mild disease, and seldom fatal in its acute stage. In almost every recorded case, peritonitis from ulcerative perforation of the intestine has destroyed life with rapidity; yet in how many instances have patients lived for weeks or months with a pulmonary fistula, and consequent empyema and pneumothorax.

In the articles above referred to we have merely detailed the history and symptoms of this disease, without entering on the highly important question of its complication with other diseases, a complication already shown to be of extraordinary frequency, and one which the study of physiology would lead us to expect. Nutrition being the fundamental function of animal life, nature has endowed its apparatus with sensibilities more delicate, and sympathies more active than any other: hence it is scarcely possible for any morbid action of consequence to exist without its being felt in the digestive system, where it will at first produce functional derangement, and sooner or later structural alteration. With these views let us briefly investigate the complication of gastro-enteric inflammation with disease in the nervous, respiratory, and circulatory apparatuses.

1. Diseases of the brain, both acute and chronic, are commonly complicated with gastro-intestinal diseases, which is in many cases the point of departure of morbid action, though in some the consequence of the reflected irritation of the inflamed brain. The headach, the somnolence, which so constantly follow an error in regimen, are examples of a slight degree of irritation of the brain, induced by the sympathetic action of the digestive system,—a degree of irritation which, if more severe, or too often repeated, may come to actual inflammation. The occurrence of epilepsy or convulsions from the same cause is familiar to every practical man, and points out to the physiological observer the close connection of the systems, and the danger of over-stimulating the digestive apparatus. These are examples of acute attacks from which the system often relieves itself without consequent injury; first, because the irritation of the digestive system is generally transient; and secondly, because the brain is not yet disorganized. But when inflammation becomes fixed in the digestive system, either in its acute or chronic form, then we may see, in the first case, the most marked evidence of cerebral irritation; and the records of medicine abound with examples where, in the second case, the long-continued sympathetic excitement has produced or been followed by a variety of diseases of the brain, and where the original affection was unknown or mistaken, and consequently maltreated.

We are far from believing that most cases of cerebral irritation are secondary to a gastro-enteritis; but medical writings—not to mention our own observation—can be safely appealed to in support of the doctrine that a number of them are thus produced: and it is to the important consesequences of this knowledge that we wish to call the attention of our readers. From ignorance of this fact, many cases of arachnitis, and especially that of children, are improperly treated; for the cure is attempted by revulsion upon the originally suffering organ. In the language of the day, the purging practice gets a "*fair trial*," and the child dies more often of the exasperated intestinal inflammation than of the disease in the brain. From this complication not being recognised, every one must have seen great errors in practice. More than once, in cases where convulsions had supervened on symptoms of gastric disease, we have seen the cure attempted by the exhibition of the most stimulating antispasmodics — a practice always improper, but in such a case mischievous in the highest degree. We recollect more than one instance in which eminent practitioners prescribed for this disease a combination of ether, ammonia, tincture of assafœtida, camphor, and opium, where every dose produced a convulsion. In one of these cases life was apparently saved by a timely inhibition of the antispasmodics, and the substitution of drinks of cold water, (the best medicine in such a case,) and the use of leeches to the head and epigastrium.

We have already given examples of the effect of gastro-intestinal inflammation in inducing irritations of the brain and spinal marrow in the adult, and have alluded to the remarkable fact, that where the sympathetic excitement of the nervous system is severe, many of the proper symptoms of the original disease are absent. This fact, observed by Hippocrates, is one of great practical importance, as it teaches us that in such cases the most violent disease may exist in the digestive system without pain, and often without other symptoms commonly observed in the uncomplicated disease. On this subject Lallemand makes the following excellent remarks:—"It is not because the pain of the head is more severe than that of the abdomen, &c. that this disappears, for there is frequently no headach; it is not because the inflammation is more violent, since a serous or sanguineous effusion will produce the same result; but it results from this, that pain being the result of a sensation perceived by the brain, whatever alters its functions removes this symptom of the inflammation. But if this inflammation be intense, it is not influenced in its development by the cerebral affection, and all its other phenomena continue, because, unlike the sensibility, they are not under the dominion of the brain: *the disease runs its course in a more dangerous manner, because it is more difficult to recognise, and causes death, which is attributed to the cerebral affection, although this is but a secondary disease.* On dissection, we are often surprised to find so little relation between the symptoms (cerebral) and morbid alterations." (*Lallemand*, Lettres sur l'Encéphale, 2.)

The supervention of fever in the course of softening of the brain is generally owing to some inflammatory affection of other organs. The seat of this is so frequently in the digestive system, that in such cases the mere occurrence of fever should lead us to investigate narrowly the state of the digestive tube. All the cases where fever occurred, as recorded by Lallemand, presented this complication, although in most of them the belly was soft and free from pain. The importance of these facts in the treatment of cerebral disease must be evident to every unprejudiced mind, more particularly when the revulsive treatment is considered. How constantly is the emetic and purgative plan used for the relief of cerebral diseases; and yet there are abundant facts to prove that such treatment, as a general rule, is always hazardous, and often the immediate cause of death. The writings of Desault have been one cause of this prejudice in favour of the revulsive treatment, as directed on the digestive system; but how few follow exactly the mode which he has laid down! Practitioners seem to forget that it is clearly illogical to conclude, as so many have done, that, because a moderate revulsive treatment is useful in injuries of the head, the same is equally applicable to idiopathic encephalitis: the cases are essentially different. Morel, in his translation of the work of Richter on wounds of the head, states that the experience of five years, during which he was a pupil of Desault, has taught him that the success of the tartrate of antimony in injuries of the head was never attributable to the vomiting which it might produce, but that, on the contrary, this result always exasperated the disease. Lallemand declares that tartar-emetic is a most hazardous remedy in cases of cerebritis, as, whether it produces vomiting or is retained, it may be injurious; in the one case apparently from the mere act of vomiting, in the other by inducing a gastro-intestinal inflammation.

With respect to purgatives, we are far from wishing to inhibit their employment in cases of disease of the brain, as there are unquestionable instances of their utility; but we protest against their empirical employment, and insist on the necessity of carefully investigating the state of the mucous membrane, and of bearing the facts which have been detailed in mind, before we attempt any thing that may compromise the integrity of so important an organ.

In the treatment of delirium tremens we have often witnessed the worst effects from overlooking the state of the stomach. Although we do not believe, with Broussais, that this affection is merely the result of the sympathetic irritation of the brain from an inflamed stomach, yet we feel satisfied that in those cases where the disease has supervened on a debauch, there is more or less of gastric inflammation. From not recollecting that most important law in pathology, that similar symptoms may be induced by opposite states of an organ, a grievous error is commonly committed in the treatment of delirium tremens. For example, a person who has been in the daily habit of drinking spirits meets with an accident; he is placed in an hospital and debarred from his usual indulgence; symptoms of delirium tremens supervene, *which are found to subside on the stimulus being resumed.* From this fact has arisen the practice of giving stimulants in the disease occurring after a debauch, but it requires little acumen to see that these are two essentially different cases. We have often witnessed the result of this unphilosophical treatment: the symptoms of delirium tremens are converted into those of encephalitis, and a violent gastritis or gastro-enteritis is induced.

In the case of debauch the stomach has been over-excited, and is probably inflamed; another organ is suffering, and of course many of the proper symptoms of gastritis will be wanting: but even where there was no indication of gastritis but thirst and epigastric tenderness, we have seen the most striking effect on the nervous symptoms produced by leeching the epigastrium: we have seen it remove the tremour, the giddiness, and the want of sleep.

II. Let us next examine the coincidence of gastro-enteric with pulmonary inflammation. An extensive hospital experience has proved to us that this is a most frequent occurrence, and one of vast importance in the treatment of disease. There is a circumstance connected with this complication which is often a source of its diagnosis, namely, *that it frequently gives to the disease a typhoid character.* We say frequently, because we have seen the combination to exist without typhoid symptoms, and because we have known simple pulmonary inflammation to cause these; but these cases seem to be exceptions to the general rule.

This combination of gastro-intestinal with pulmonary inflammation takes place equally in affections of the mucous membrane, of the parenchyma, and serous investment. It is also an almost constant attendant on phthisis, in which its supervention exercises a remarkable influence on the progress and curability of the disease.

One of the most frequent forms of disease in Dublin is that which may be termed the gastro-catarrhal fever. It is a disease in which there is an inflammation both of the pulmonary and gastro-intestinal mucous membranes. It is one of great danger, and from the following circumstances: — 1. the existence of an intense gastro-enteritis; 2. the fact that the bronchitis is almost always double and universal; 3. that at the time when the bronchitis is passing into the second or secretive stage, there is generally profound debility, so constant in gastro-intestinal disease; expectoration cannot take place, and the patient dies of asphyxia. These are sufficient to prove the danger of this disease; and we may add that, as in the complication with cerebral disease, the gastro-enteritis in this instance *is constantly observed without pain, tenderness, or vomiting.*

In such cases it would appear that the mucous inflammation is in some instances the cause, in others the consequence of the fever; but whether it be cause or effect, it is to its reduction that the efforts of the physician are to be mainly directed. How important, then, must be the recognition of the gastro-enteritis! Independent of any theory, an extensive experience has led us to conclude that in these cases all practice tending to relieve the chest by revulsion to the gastro-intestinal surface, whether by nauseating or purgative medicine, is improper. The chest will not be relieved, and the gastro-enteritis will invariably be aggravated. The true principle of treatment is to deplete both the respiratory and digestive systems, and this is to be effected chiefly by local bleeding and counter-irritation. We say local bleeding; for in many of these cases general bleeding is inefficacious and sometimes injurious. This result appears due to the gastro-intestinal complication; for in simple bronchitis the lancet is constantly of the greatest utility.

There is a remarkable fact connected with this disease, to which we have alluded in the article ENTERITIS,— namely, that the inflammatory action seldom possesses the same degree of intensity in both systems at once; we observe a species of alteration of intensity. Thus, when the swelling and tenderness of the belly, the diarrhœa, the redness of the tongue, and the typhoid symptoms are best marked, we find the face least livid, the breathing and cough easier, and the stethoscopic signs of disease by no means so evident. But in the progress of the same case the gastric affection will appear to subside, to be replaced by all the signs of an intense bronchial inflammation. In the course of a gastro-catarrhal fever this change of symptoms may occur several times. The knowledge of this is of practical importance, for the apparent diminution of the symptoms of gastro-enteritis does not imply that the parts have become healthy; and if we practise on this supposition, we may be sure that the abdominal disease will re-appear with violence. This we have seen to occur from a dose of tartar-emetic, or a purgative pill. In some cases where the patients have died during the exacerbation of the bronchitis, we have found numerous intestinal ulcerations, although the surrounding mucous membrane was pale. (See ENTERITIS.)

The practical conclusions which the knowledge of the gastro-intestinal complication leads us to, appear to be the following:

1. That, as a general rule, the lancet is to be used with much more caution in this complication than in simple bronchitis.

2. That we are to place our chief reliance on local bleeding and counter-irritation, on both the chest and abdomen.

3. That the emetic and purgative treatment is in these cases highly dangerous.

4. That the combination of mercury with opium exhibited so as to induce ptyalism, appears to be the remedy most entitled to confidence, after local bleeding and the use of blisters.

5. That the apparent subsidence of one class of symptoms does not imply that the disease from which they arose has subsided.

6. That in the convalescence of these patients peculiar attention must be paid to the state of the gastro-intestinal tube, as a slight error in diet or an over-dose of laxative or purgative medicine may be productive of the worst results.

The existence of a bronchitis is much less likely to induce a gastro-enteritis than the latter to induce the former. This, however, is only one of the exemplifications of the fact that the digestive system is endowed with more powerful sympathies than any other. Facts are still wanting on the subject of thoracic disease supervening on abdominal, but every observer must admit its frequency. We have thus a key to the explanation of the tussis verminosa, the tussis hepatica, the dyspeptic phthisis, &c. A circumstance of not uncommon occurrence well illustrates the danger of the empirical treatment of gastro-enteric inflammation. When the disease predominates in the lower part of the tube, diarrhœa, as formerly stated, is a common symptom, either as occurring from acute or chronic enteritis. Nothing is more common than the treatment of this by astringents, or by stimulants, such as the turpentines. Now we have frequently observed that, where the secretion was thus arrested, the diseased action appeared to be immediately translated to the bronchial surface, and these cases are always of the worst description. All the results of inflammatory action on the lung may be thus produced, yet the evil is seldom attributed to its proper source. The best mode of avoiding this accident in cases where we are forced to resort to the astringent and stimulating treatment of diarrhœa, is at the same time to determine to the skin; and the means which have succeeded best in our hands are the warm bath, counter-irritation on the abdomen, and the use of flannel next the skin. We should also in the treatment of such a case diligently watch the state of the respiratory function, and on the first appearance of disease, as shown either by symptoms or the stethoscopic signs, immediately omit the remedies calculated to arrest the abdominal secretion.

Of the combination of pneumonia with disease in the digestive tube, we have witnessed a vast number of cases, and it appears highly probable that the disease termed by the older authors the *putrid pneumonia, pneumonia typhodes,* &c. is an example of this combination. About two years ago, so many cases of this disease were admitted into the Meath Hospital, that it might be considered as epidemic in Dublin. The patients generally presented the following symptoms. There was great prostration, often much more than could be accounted for by the extent of the pulmonary affection as observed by the stethoscope. The skin was generally cool and clammy, and frequently covered with small livid petechiæ; the pulse small and feeble, and the countenance collapsed and anxious. But little pulmonary oppression was complained of; there was cough, and in some cases the rusty sputa occurred, while in others nothing but a little colourless mucus was expectorated. The detraction of a few ounces of blood almost invariably produced syncope, and did not afford any relief to the patient. In a few cases the blood presented the inflammatory crust, but in the great majority this appearance was absent. In addition to these symptoms we remarked a red and crusted tongue, and, frequently, sordes on the teeth; there was thirst, some swelling of the belly, which was tender, particularly in the epigastric and right iliac regions, and often diarrhœa. The intellect was obtuse, and occasionally a low delirium supervened. On examination by the stethoscope and percussion, the usual signs of the different stages of pneumonia were observed, and in several cases the disease, contrary to its usual course, occupied the superior portions of the lung.

This was an extremely dangerous and unmanageable disease; many of the cases proved fatal, and in those where the disease was arrested, the convalescence was very tedious and doubtful. The pulmonary congestion resolved with great slowness; and where hepatization had occurred, the dulness on percussion continued for a great length of time. The patients remained in a semi-hectic state, and nutrition went on slowly. In the fatal cases death appeared to be induced much more by the abdominal than the thoracic disease, which was seldom so extensive as to account for the fatal termination. On dissection, the various appearances of the different stages of pneumonia were found. The stomach was generally more or less vascular and softened; but it was in the lower third of the ileum that the greatest destruction was found. Here the mucous membrane was intensely injected and of a purplish-red colour. The glands of Peyer and Brunner had become extensively ulcerated, and in some cases suppuration of the mesenteric glands was observed to a great extent. The blood was fluid and dark-coloured, and the peritoneum had a livid hue.

If we compare the description given of the *nervous peripneumony* by P. Frank, we must observe a striking resemblance between it and the disease under consideration. In both we have the pulmonary inflammation conjoined with a group of typhoid symptoms. He also speaks of an epidemic pneumonia combined with gastric symptoms, and in both cases points out the inability of the patient to bear free bloodletting. From the light which the study of the phenomena of gastro-enteritis has thrown upon the nature of typhoid inflammations, there can be little doubt that in these cases much of the typhoid character is owing to the abdominal complication, and we may consider the nervous and putrid pneumonia of the older writers as of this nature.

But does the mere existence of this gastro-enteric inflammation necessarily produce a typhoid state in cases of pulmonary disease? or are both the pulmonary and gastric symptoms the result of the secondary inflammations so constant in fever? We incline strongly to the latter opinion, as we have seen an intense enteritis with pneumonia where the typhoid symptoms were absent, and where the patient bore large bleedings well. But in a practical point of view, this question is not of great importance; because, whether the gastro-enteritis be the primary affection, or secondary to the typhoid state, its existence is of the greatest importance in the prognosis and treatment of the case. This we have mentioned in the article Gastritis, where it is stated that the tartar-emetic treatment of pneumonia, as recommended by Laennec, is full of danger in these cases. The opinion of this author, that a gastro-intestinal complication does not contra-indicate the use of tartar-emetic in large doses, in cases of pneumonia, is one of the few errors in the work of that great man, — an error which it is much to be feared he was led into by his too great prejudice against the doctrines of the physiological school.

We have not observed in this disease, as in the gastro-catarrhal fever, those remarkable alternations of symptoms between the chest and abdomen; the character of the disease being seldom changed throughout its course.

The practical conclusions which the knowledge of this complication of pneumonia leads to, are the same as indicated when speaking of the gastro-catarrhal fever. In this disease the strength of the patient must be supported by farinaceous foods, jellies, and chicken-broth, from an early period, even while we are using local bleeding to the chest or abdomen. The best internal remedy seems to be the combination of calomel with Dover's powder, given with a view to induce ptyalism. This should be assisted by mercurial frictions. As soon as the gums are decidedly affected, the inflammatory action often begins to subside. At this period we have also found the greatest advantage from the use of the polygala senega, exhibited in the following manner:

℞ Decoct. polygalæ senegæ, f.℥vii.
Tinct. scillæ marit. f.ʒii.
Tinct. opii camphorat. f.ʒvi.
Carbonat. ammoniæ, gr. xv. — ℈i. M.
capiat coch. ampl. i. secundis horis.

If this remedy be given before ptyalism is induced, it will not be found beneficial; but after this effect has occurred, it will seldom disappoint the practitioner. This will be generally the time to administer small quantities of wine, regulating its use by the effect on the pulse and fever. When, after the use of wine, the frequency of the pulse is diminished, and its fulness increased, we may be sure that the remedy was indicated.

We must never forget that for the successful treatment of the case, both during its acute stage and convalescence, *the double seat of the inflammation must be constantly kept in view.*

The occurrence of inflammation of some part of the digestive tube in cases of phthisis, is a circumstance of extreme frequency in this disease, and one that exercises a powerful influence on its progress and the chance of recovery. It most usually presents itself under the symptoms of what is called the phthisical diarrhœa, but has been observed in a much more acute form.

As in cases of idiopathic gastro-enteritis, and in that supervening in fever, so in this disease we may meet with the inflammation in some cases predominating in the upper, in others in the lower part of the tube. The lesions of the mucous membrane of the stomach are indicated by loss of appetite, nausea, bilious vomiting, and epigastric pain; the tongue may or may not be indicative of the gastric disease. These symptoms we regret to say are generally disregarded in cases of phthisis, and in numerous instances we have seen the worst consequences from this oversight. The vomiting in particular is attributed to the effect of coughing, as in pertussis, and there is no doubt but that it may be thus induced; but in those cases, as Louis has remarked, the appetite is good, the digestion easy, and the epigastric pain is wanting. It is further to be recollected that vomiting independent of disease of stomach most commonly occurs in the early periods of the case; but that in the more advanced stages it is almost always the result of gastric inflammation. On this subject, however, it would not be right to omit the following remark of Louis: — "Nevertheless, in this instance, as in a thousand other circumstances, there are facts which defy the sagacity of the observer, and form exceptions to the most general laws. Thus in the last months of his existence, one of our patients had epigastric pains, nausea and vomiting, both during the cough and its intervals, although the mucous membrane of the stomach was perfectly healthy." (Recherches sur la Phthisie.)

As an encouragement to our paying particular attention to the state of the stomach, it may be mentioned that there are facts on record which prove that, even in phthisis, an ulcer of the stomach may become cicatrized. The gastritis in this disease is almost always secondary to the tuberculization of the lung; but by interrupting nutrition, and by the prostration of strength which it induces, it exercises a most fatal influence on the progress of the disease. Seldom recognised, and constantly exasperated by the introduction of stimulants under the name of tonics and expectorants, it adds incredibly to the sufferings of the patient; and where from this mistaken treatment, and from the use of stimulating diet, it becomes acute, the respiration grows hurried and laborious, and additional blisters are mercilessly laid on the patient's chest, while the source of his increased suffering is wholly overlooked.

But the most striking as well as most frequent indication of abdominal disease in phthisis, is the occurrence of diarrhœa, a symptom the nature of which is not yet sufficiently appreciated by medical men. From the fact that this symptom is occasionally suspended when the perspirations are copious, an occurrence by no means so general as has been represented in books, it is looked on as a sort of vicarious discharge, and its cause, which is an enteritis, is seldom recognised. From this error great injury constantly follows. Diarrhœa in phthisis is an almost certain indication of disease in the mucous membrane and glands of the ileum and colon; a chronic inflammation, terminating in ulceration of these tissues. In the present state of pathology, it may be laid down that diarrhœa in phthisis almost never occurs without enteritis; and further, that in this disease we may have some degree of enteritis without diarrhœa. This, however, is a rare case, and in our experience has only occurred where the colon escaped alteration. The experience of more than a hundred cases, in which we have made a post-mortem examination, has convinced us that in phthisis the diarrhœa is the result of inflammation and ulceration of the intestine, — a conclusion which we look upon to be as free from exception as any doctrine in medicine can be; but one, however, which, though not new, is far from being sufficiently recognised. It is most important to consider this secondary enteritis, in cases of phthisis, both with a view to the curability of consumption, and also to its palliative treatment. Of one fact we are convinced, namely, that the absence of enteric inflammation greatly prolongs the existence of a phthisical patient, and of course increases the chance of a cure. We know that in most cases of chronic phthisis an attempt at cure is established by nature, the mechanism of which has been developed by the immortal Laennec. For the success of this attempt two conditions appear requisite, — one, that the life of the patient shall be prolonged so as to allow time for the cicatrization of the abscess; the other, that the tuberculization of the lung shall not advance so as to produce too extensive disorganization of the part. Now the first of these is mainly influenced by the supervention of the enteritis. In all the cases of very chronic phthisis which we have observed, the intestinal disease either did not occur, or only supervened at the very close: in these cases the disease lasted for years. But we believe also from observation, that the second condition is greatly influenced by the state of the digestive system; as, after the diarrhœa has commenced, the disease, as observed by the stethoscope, has advanced with increased rapidity; a circumstance not at all strange to the pathologist, and explicable by the sympathetic irritation and lesion of nutrition.

We have now had the good fortune to witness the recovery of several patients in whom the stethoscope unequivocally indicated the existence of tuberculous cavities. *In none of these cases was there any enteric complication.* The disease advanced slowly, and time was given both for the efforts by nature, and the operation of remedial measures.

From considering phthisis in all cases merely as a pulmonary affection, and from not estimating the importance of gastro-intestinal disease as influencing its progress, a fatal error is commonly fallen into: this we have often witnessed. A young female ceases to menstruate; this may or may not have been preceded by pulmonary irritation; but in most instances some affection of the lungs is present: she gets worse, and consumption is apprehended; the symptoms are attributed to the amenorrhœa, and the cure is attempted by forcing the uterine action by the medicines called *emmenagogue*. A variety of substances, all highly stimulant to the gastro-intestinal surface, are exhibited; many of them, such as aloes, savine, &c. &c. of a drastic nature; the result of which is, that a diarrhœa is established, attributed at first to the medicines, but from its obstinacy showing that it proceeds from a diseased state of the bowels. The phthisical symptoms advance rapidly; the menses do not re-appear; and the patient dies of what is called a *gallopping consumption.* We have actually known cases where the emmenagogue system was continued after the phthisical diarrhœa was established, and cavities formed in the lung. Such lamentable circumstance may well be appealed to by those who ridicule medical science; but the opprobrium ought to fall on the individual practitioners who will not stoop to learn what the science is capable of teaching.

Although so instrumental in accelerating the fatal termination of phthisis, enteritis is seldom a cause of sudden death in this disease. Notwithstanding the number and extent of the ulcerations, yet perforation of the intestine and consequent peritonitis is extremely rare; a most interesting fact, and one which we have endeavoured to explain in the article ENTERITIS. The only case of phthisis in which we have found perforation of the intestine was an example of acute development of tubercle, accompanied with intense pulmonary irritation and obscure abdominal symptoms. On dissection, several perforations were found, but the fœcal matter had not escaped into the serous cavity. The disease in the intestines was most extensive, and could never have been suspected from the symptoms;—another instance of the latency of abdominal inflammation when other disease exists. This case is published in the fifth volume of the Dublin Hospital Reports. We have witnessed one case, where sudden death occurred from hemorrhage of the bowels. The patient in an advanced stage of phthisis, while at stool suddenly fell down dead. A large quantity of blood was discovered in the night-chair; and on dissection the colon was found extensively ulcerated and filled with blood. This termination of phthisis is, we believe, not noticed in any of the systematic works. The case will be found in the Transactions of the Association of the College of Physicians of Ireland, 1827.

In the more acute forms of phthisis, the complication with enteritis may also exist; but on this subject facts are still wanting. In some instances we have seen the disease commence with violent symptoms of bronchitis and dysentery, and pass into those of phthisis and diarrhœa. These cases were not unfrequent after the late epidemic fever in Dublin, and were observed chiefly in the convalescent patients. One case occurred during this period which is remarkable, as it presented the symptoms of an intense irritation of the gastro-intestinal mucous membrane, yet on dissection this tissue was found generally healthy. The solid viscera of the abdomen, however, were universally tuberculated, the tubercles being in great quantity and in various stages from the miliary to the crude state. The lungs were completely filled with miliary and granular tubercles, and the bronchial mucous membrane highly vascular. From the symptoms referable to the abdomen, we fully expected to find an intense gastro-enteritis; there being tenderness of the abdomen, with tumefaction, purging, the tongue dust-coloured, great thirst, delirium, and involuntary evacuations. The only morbid appearance in the tube was a slight vascularity and softening of the ileo-cæcal portion, with some enlargement of the muciparous glands —an extent of disease quite insufficient to account for the symptoms. How far these are to be referred to the condition of the solid viscera is a subject for further investigation.

In the treatment of phthisical diarrhœa it is of consequence to bear its true pathology constantly in mind, even though we should despair of effecting a cure. The disease itself is so full of danger, and the symptoms so distressing, that its palliation is an object of great importance; and this will be best effected by acting on pathological principles. Although astringents are not unfrequently our only resource, yet their indiscriminate use is dangerous, as the checking of the secretion may be followed by increase of fever, and great aggravation of the pulmonary symptoms. This is more commonly observed in cases where the disease has not arrived at its last stages. The mind of the practitioner should be impressed with the fact that the disease is an enteritis, and to be treated as such; and we can safely assert that in hospital practice we have found the application of a blister to the abdomen seldom fail in arresting the diarrhœa, and giving the greatest relief. In this practice there is no danger, for it is not empirical; we do not arrest a secretion without removing or modifying its cause. In more than one case in which astringents and opiates had failed, this practice was followed by a permanent removal of the diarrhœa.

In our treatment of phthisis we should never lose sight of the following facts and conclusions with respect to the gastro-intestinal system:—

1. That a complication with some form of gastro-enteritis is exceedingly frequent.

2. That this complication is to be guarded against as far as possible, as its supervention exercises a fatal influence on the progress of the pulmonary disease, a result explicable by the lesion of nutrition and the sympathetic irritations.

3. That when the disease predominates in the upper portion of the tube, we have the usual symptoms of chronic gastritis superadded to those of phthisis; and when in the lower, diarrhœa is the most prominent phenomenon.

4. That where the signs of disease of the stomach exist, the diet must be of the most unstimulating kind, and that we cannot hope for benefit from tonic, stimulating, or expectorant medicines.

5. That in all stages of the disease, purgative medicine, particularly of the drastic kind, must be avoided.

6. That the diarrhœa of phthisis is the result of an enteritis with ulceration of the intestine, and that hence the *indiscriminate use* of astringents is as objectionable in this as in other forms of intestinal disease. (See DIARRHŒA.)

III. The limits of this article will not permit us to enter on the interesting questions of the connection between gastro-enteritis and disease in the circulatory and genito-urinary systems; but we shall say a few words on its complication with *hepatic disease.*

There is no part of the digestive apparatus to which the attention of physicians has been so long directed as the biliary system. The diseases of the liver, indeed, have been more studied than all the other lesions of the digestive apparatus; a circumstance mainly arising from the long reign of the humoral pathology, which attached such importance to the composition of the bile, and referred so many diseases to its alterations. Much of this doctrine still remains, although modern medicine has shown, whilst still allowing the necessary importance of the biliary apparatus, that we must consider it, both physiologically and pathologically, as secondary in importance to the gastro-intestinal surface.

The general similarity of symptoms that arise from abdominal disease tended much to retard our knowledge of the importance of diseases of the digestive tube; as in thousands of instances these were and still are described as examples of hepatitis either acute or chronic. This is an error so great, and one so universal in these countries, that it is no exaggeration to designate its consequences as dreadful.

Hepatitis in these countries is much less frequent than inflammations of the digestive tube,—a fact established by pathological anatomy, and one, the more extensive recognition of which would be fortunate for the British public. From mistaking gastro-enteritis for affections of the liver, two great evils result;—one, the neglect of the actual disease; the other, its exasperation by the means supposed capable of removing the hepatic affection. Revulsion to the mucous membrane is attempted; in other words, a tissue already in a state of inflammation and the source of the symptoms, is submitted to a double stimulation. Disorganization is thereby effected, and what was at first a simple and curable disease of the mucous membrane, becomes a chronic and incurable lesion, not only of this tissue, but of the solid viscera of the abdomen. The patient dies; and in the hepatic and splenic disease then observed, the practitioner sees a vindication of the treatment which has assisted to produce them.

The relation which exists between secreting organs and the surfaces with which they communicate, is not sufficiently recognised by practical men. It is a subject full of importance to the practice of medicine. Without denying that the glands in question may primarily contract irritation, yet Bichat has shown that the natural mode of excitement of these organs is a stimulation exerted on the surface of relation with which they communicate; a stimulation which, in the state of health, will only induce the physiological action of the organ, but which, if excessive or too constantly repeated, will ultimately induce disease in the secerning organ itself, by the operation of one of the best established laws in physiology or pathology. We must admit that in declaring, as a general rule, that all inflammations of the liver are secondary to a gastro-enteritis, Broussais has come to a too sweeping conclusion. He deserves great credit, however, for demonstrating the frequency of the sympathetic irritation going on to true inflammation, and thereby rendering the liver itself a centre of fluxion. These remarks apply more especially to the supervention of chronic hepatitis on long-continued stimulation of the stomach and duodenum, the consequence of a life of luxury or indulgence in ardent spirits. When the liver-disease is established, it is plain that a principal indication will be to remove or modify the original exciting cause, and to adopt such treatment as may have least chance of exasperating the diseased state of the mucous membrane.

The production of hepatitis consequent on gastro-intestinal inflammation is a subject not yet wholly cleared up. In all probability its most common cause is the sympathetic irritation or increase of the excitement which the surface of relation naturally exercises on the secerning organ. But there are cases in which additional causes seem to have acted. Thus it is believed that in some instances, inflammation has spread by continuity of surface from the duodenum along the biliary ducts,—an opinion, however, which requires further confirmation before it can be adopted. Bouillaud and Ribes believe that in many cases the inflammation is conveyed to the liver along the internal coat of the vena portæ and its ramifications; and in the *Clinique Médicale* by Andral, two cases are recorded confirmatory of this opinion. The first is of a patient who was attacked with fever and gastro-enteric symptoms, followed by painful tension of the right hypochondrium and slight jaundice. On dissection, the stomach, lower portion of the ileum, and the cæcum were found inflamed. The liver was enlarged, very red, and much engorged with blood. It was further found that the internal surface of the inferior mesenteric veins, the trunk of the porta, and its ramifications, was intensely red, while the splenic vein and the cava appeared natural. The aorta was white; and hence it was concluded, and we think justly, that this was an example of inflammation of the abdominal veins, — a phlebitis, which being propagated to the liver, was the cause of the hepatic disease. In the second case the first symptom was a diarrhœa, followed by pains in the region of the liver, jaundice and ascites. On inspection, the liver was found in the state of red induration, and the internal surface of its veins vividly red. The same was observed in the trunk of the porta and its hepatic branches, the internal membrane of which was soft, friable, and in many places lined with an unorganized false membrane. The gastro-intestinal system presented marks of extensive chronic disease; and it is only to be added, that the general vascular system was found perfectly healthy; so that we cannot attribute the appearances in the porta to any thing but inflammation.

These cases are probably analogous to that described by Reynaud, in a patient who had experienced several attacks of jaundice, in which the right branch of the porta and the inferior cava had become obliterated. A collateral circulation was established principally by means of the external veins, not however sufficient to prevent the occurrence of dropsy.

The following conclusions seem fairly deducible from the recent researches of anatomists, with respect to the connection between gastro-intestinal and hepatic disease: —

1. That in most cases of hepatitis there is a complication with gastro-intestinal inflammation.

2. That in the majority of instances where this complication has occurred, the hepatitis has been secondary to an acute or chronic gastro-enteritis.

3. That in such cases the supervention of the hepatitis does not imply the subsidence of the gastro-intestinal disease.

4. That in the smaller number of cases the hepatic disease has preceded that of the intestine.

5. That idiopathic hepatitis may occur without any gastro-intestinal complication whatsoever. This is the rarest case.

6. That in cases where the complication does exist, we cannot always find that the intensity of the one disease is proportional to that of the other.

The influence which inflammation of the upper part of the digestive tube, particularly of the duodenum, exerts in producing hepatic disease, has been much insisted on by the physiological school. That many instances of hepatitis are thus induced, there can be no doubt; but it is true that cases have occurred where this portion of the tube was found perfectly healthy. (See the works of Louis, &c.) We formerly alluded to the production of jaundice from gastro-duodenitis, and believe that it is its most common cause. It is a curious fact, that in the yellow fever, where gastro-enteritis is so frequent, inflammation of the liver is rarely observed, although considerable alteration of the colour and consistence of this viscus is common.

IV. But we have yet to handle one of the most important parts of this subject, namely, the connection between gastro-enteritis and the phenomena of fever. Were we to enter into this at full length, we should far surpass the limits of this article; but we shall content ourselves with inquiring how far that part of the doctrine of Broussais, which refers continued fevers to a gastro-enteritis, is capable of proof. Here we wish to correct an error which is general,—namely, that Broussais attributes *all* fevers to a gastro-enteric inflammation. Such is not the fact, as all candid persons will admit who consider the two following propositions of his doctrine:—"Les irritations intenses *de tous les organes* sont transmises au cœur; alors il précipite ses contractions; la circulation s'accélère, et la chaleur augmentée de la peau détermine une sensation pénible: c'est ce que l'on doit appeler *la fièvre*, qui est ici considérée d'une manière générale." (Prop. cxi.) "La fièvre n'est jamais que le résultat d'une irritation du cœur, primitive ou sympathique." (Prop. cxii.) (*Broussais*, Commentaires des Propositions de Pathologie, 1829.)

The following is the opinion of this author on the subject of the connection of gastro-enteritis and fever. He believes that acute gastro-intestinal inflammation, when exasperated, will represent what has been called the putrid, adynamic, or typhous fever; and that in those cases where the sympathetic irritation of the brain is considerable, the disease will represent the malignant ataxic or nervous fevers. The truth of this proposition is not to be denied; but when he declares that all the essential fevers of authors are to be referred to a simple or complicated gastro-enteritis, we believe that he has not made out his case.

It cannot be denied that this doctrine, received at first with such contempt, and scouted so generally by medical professors, especially in this country, has gained ground to a remarkable extent; and although few, except the immediate pupils of its founder, go to the full length of his opinions, yet all who look at disease with an unprejudiced eye, and who enjoy opportunities for observation, now admit that in the production, progress, and phenomena of fevers, the digestive tube takes a most important part. In fact its pathology furnishes a key to the treatment of a vast number of cases formerly termed essential or idiopathic fevers; a denomination, happily for mankind, now beginning to be forgotten.

Will gastro-enteritis cause the phenomena of fever? and what will be the character of that fever? The state of the science on this subject can be shortly expressed. Gastro-enteric inflammation may cause all the phenomena of fever. It will especially cause prostration, headach, delirium, subsultus, coma, thirst, anorexia, sordes, morbid tongue, tympanitis, petechiæ. All these symptoms may subside under treatment calculated to remove a gastro-enteritis, and will be exasperated by an opposite treatment. This inflammation further may present this group of symptoms without pain or tenderness of the abdomen. On this subject we shall quote from Andral:—"Confirming by our researches the admirable observations of M. Broussais on the painless character of a great number of intestinal inflammations, we stated in 1823, that we might be exposed constantly to overlook the most intense enteritis, if we only admitted its existence in cases where pain occurred. Since the publication of these researches, numerous works published by disciples of the most different schools, have shown that the intestines may be very profoundly affected without pain being present. We have seen this pain wanting, 1st, in cases of simple erythema of the mucous membrane; 2d, in those where numerous exanthematous patches covered the small intestine; 3d, where the large intestine was affected; 4th, where there were ulcerations, either in the ileum, cæcum, colon, or rectum. We have found the deepest ulcerations in subjects where there was no pain; and it is to be remarked that we only speak here of cases in which the intellect of the patient was not affected." (Clinique Médicale.)

The knowledge of these most valuable facts requires to be spread much farther than has been hitherto done. Many practitioners cannot separate the ideas of pain and inflammation, and it has again and again happened to us to see the most fatal results from this scholastic error.

One of the most constant characteristics of the fever in this disease is prostration; and there is no local inflammation which will so peculiarly induce this state as an acute gastro-enteritis. The fever may be inflammatory or typhoid in its symptoms; it is commonly similar to the synochus of Cullen; it may be remittent or even intermittent. To prove every part of this proposition thousands of cases may be cited. (See the works of Andral, Louis, Bouillaud, Bretonneau, Rœderer and Wagler, Boisseau, Hewett, Bright, Abercrombie, Cheyne, &c. &c.) Gastro-enteritis may, then, occur with every form of fever; but it may also exist without fever; from which fact an argument may be drawn against the doctrine that the typhoid or adynamic fevers are nothing but examples of gastro-enteritis either simple or complicated. It is plain that these affections present a pretty constant and peculiar group of symptoms, and that, even supposing gastro-enteritis to exist in them all, there must be something else to give the disease its peculiar character.

Let us examine the state of the digestive tube in fevers, particularly that of the stomach and small intestines. Now there is abundance of facts to prove that when death occurs in the course of a fever, we may find the stomach healthy, and even in the cases where alterations of this viscus are found, they have no peculiar appearance so as to constitute an anatomical character; nor, as Andral remarks, are they different from those in the bodies of others who have died of various acute and chronic diseases. We cannot then affirm that every continued or typhous fever implies the existence of a gastritis, or that this disease will cause the phenomena of fever in all instances.

But the alterations of the small intestine are much more constant, and it was from this circumstance that the doctrine of Broussais mainly arose. We apprehend that an inflammation of the mucous glands is much more frequent in Paris than in this country; and it was natural to consider the disease in the intestines, with regard to the fever, in the same light as an inflamed state of the lung was considered with regard to the symptoms of pneumonia. Louis also, one of the most accurate and trustworthy investigators, has declared that the inflammatory development of the mucous glands is the anatomical character of typhous fever. But even admitting that such was universally the case, still the doctrine that the symptoms of fever in these cases proceeded from this disease would not be proved, because the intestinal disease may as well be considered as secondary to the fever as the pustules of small-pox to the state of the system induced by its contagion. No one would say that the cutaneous eruption was the cause of small-pox, and we cannot help believing that the "*intestinal exanthem*" in many fevers is produced by a similar process, and bears a similar relation to the constitutional affection. (See the experiments of Gaspard, Magendie, &c. Journal de Physiologie.) But whether the intestinal disease be primary or secondary, it becomes absolutely necessary, in cases where it is recognised, to direct our treatment towards its removal, and carefully to avoid every thing that can exasperate it. We believe that the disciples of Broussais may have carried the antiphlogistic plan too far in fever; but if they have killed their thousands, the followers of Brown and Hamilton* have killed their ten thousands. In the treatment of fever there are two great points for the practitioner to look to,—one, the strength of the patient; the other, the state of the viscera. In the majority of cases his practice should be to remove local inflammation, for it is of this that ninety-nine out of the hundred die; but should a case arise where, from the condition of the patient, he cannot attempt to fulfil the latter indication, let him at least not exasperate the disease.

What is the common treatment of fever? a bottle of wine on the one hand, and a bottle of purging medicine on the other; and this for all fevers and all stages of the fever! We do not wish to be understood as decrying the use of tonics or purgatives in all cases, but we do protest, in the name of common sense and humanity, against their indiscriminate employment. The experience derived from the treatment of several thousand cases of fever has convinced us of this fact, that in the treatment of this disease, particularly in its early periods, we shall be more certain of advantage from leeching the abdomen, cold drinks, and emollient enemata, than any other treatment whatsoever.

We cannot conclude this hasty review of the subject better than by the following quotation from Andral:

"Does this coincidence of lesions and symptoms suffice to show that the *dothin-enteritis* causes the whole disease? We would willingly reply in the affirmative if we did not take the following great facts into consideration:—

"1. When, from injecting different putrid substances into the veins of an animal, we produce all the symptoms of the severe fevers of the human species, there are cases where at the same time we cause various lesions in the intestinal mucous membrane, particularly various degrees of follicular tumefaction and sometimes ulcerations. At other times in these experiments the same symptoms were produced without any trace of lesion being found in the intestine. In this second case, we cannot attribute the symptoms to a lesion of the digestive tube which did not exist. In the first case it is plain that the intestinal lesion was an effect, and that it was only developed by the introduction of deleterious substances into the circulation. 2. Observations formerly cited do not permit us to doubt that in the human species symptoms completely similar to those which coincide with dothin-enteritis, may occur without it, and without any lesion of the digestive tube. 3. The intensity of the lesions which characterize dothin-enteritis is not always in relation to the severity of the symptoms observed during life." (Maladies de l'Abdomen.) [See the remarks on Typhoid Fever, vol. i.]

But even with the facts as stated above before us, it must be admitted, that when all those facts recorded in the present article and the two preceding so often referred to, are duly considered, the doctrines of Broussais, with respect to gastro-enteritis, are highly worthy of a careful examination, and do not deserve to be designated, as they so constantly are, as the vague fancies of a heated imagination. When we reflect on the vast influence which gastro-intestinal inflammation exerts in the phenomena of most fevers; that in many of the eruptive diseases it is present and constitutes their danger; that in the varieties of cholera it is a common occurrence; that dysentery, diarrhœa, and a host of abdominal affections are its results; and that it produces the most important modifications in all other diseases,—complications, on the recognition of which their successful treatment mainly depends;—we cannot help expressing a feeling of gratitude to the great pathologist who has awakened the attention of the world to this universal and destructive disease. It is absurd to reject facts because their discoverer may have made use of them to form a theory which the progress of science has partially disproved; and it is worse than ungenerous to deny him that civic crown which he has so truly and gloriously earned.

William Stokes.

[GLANDERS, *Equinia*, French, *Morve*, is the most formidable of all the diseases to which the horse is subject. It has been recognised from the time of Hippocrates; and according to a recent veterinarian, (W. Youatt, *The Horse*, p. 129, Amer. edit. Philad. 1843,) few modern veterinary writers have given a more accurate or complete account of its symptoms, than is to be found in the works of the father of medicine. Until within the last few years, the disease was considered to belong exclusively to the horse, the ass, and the mule; but unquestionable cases have occurred, showing that it may be communicated to man in either the acute or the chronic form. (Copland, *Dict. of Practical Medicine*, art. GLANDERS; and Ollivier, art. MORVE, in *Dict. de Médecine*, xxv. 258, Paris, 1839.) To this affection, the term *equinia* (from *equinus*, 'of or belonging to a horse,') has been appropriated, but it has been extended by M. Schedel (Tweedie's *Library of Medicine*, Amer. edit. i. 422, Philad. 1842) so as to include two different affections;—the one, a mild pustular disease, derived from the matter of grease in horses; the other, a disagreeable scourge, of a pustular character, and proceeding from the glandered horse.

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* We must admit that much of the abuse of purging in fever has originated in a misconception of the real doctrine of Hamilton.

1. **Equinia Mitis,** or **Grease Pox,** occurs on the hands of those who attend upon horses and dress their heels, when affected with grease. The pustules are large; very similar to those of ecthyma (q. v.); elevated; and with a red purple, tumid base. About the eighth day, they are filled with an unquestionably purulent fluid; which, about the tenth or twelfth day, begins to desiccate, forming thick scabs, and leaving well-marked cicatrices. It was at one time thought by Jenner, that the matter of grease was the source of natural cow-pox; but he subsequently modified his opinion as to the cow-pox being derived exclusively from the horse, and the idea is now entertained by few if any. (Schedel, *op. cit.* and the article VACCINATION.)

The **treatment** of grease-pox requires but little attention. Antiphlogists internally, and emollient applications externally, are alone needed.

2. **Equinia Glanduloca** is the serious affection produced by the glandered horse. It may occur either in the acute or chronic form.

Acute glanders commences with symptoms similar to those of acute rheumatism; and along with these there is much heat about the nose and trachea. A copious discharge takes place from the nostrils, which become swollen; the nose and surrounding parts are of a bright red; and afterwards of a livid colour; and the swelling extends to one or both of the eyelids. A profuse tenacious mucus, at first of a deep yellow, but afterwards of a bloody or dark sanious appearance, is discharged from one or both nostrils; and at times from the eyes. There is great agitation and tremour; the skin is hot; the pulse frequent, and usually soft and weak; the respiration short and rapid; tongue dry; thirst intense, and the mind incoherent or wandering. Livid patches appear on the sides of the nose, cheeks or forehead, which are soon followed by copious sweats, and a gangrenous state of the diseased parts, succeeded by delirium, tremour, and death in a few days. This form of the disease is said by M. Schedel (*op. cit.*) to be rarely, or never, accompanied by pustules or tumours. In the large mass of fatal cases, however, pustular eruptions and tumours are seen, which constitute *farcy glanders*, the *morve farcineuse* of the French.

The eruption, which usually appears about the eighth day, consists of large pustules in livid patches, and of small tumours on different parts of the body. The pustules are round, often umbilicated, and contain a purulent fluid, with a little coagulable lymph, in the form of a white, soft substance, very similar to that contained in variolous pustules, and in the pustules induced by the application of tartarized antimony ointment; the umbilicated form is, however, by no means constant. The size of the pustules varies from that of a pea to that of a mulberry: to the latter they often bear a great resemblance in their deep purple colour. Gangrene occasionally occurs in some of these.

Along with the eruption, small tumours appear on different parts of the body, having a shining red appearance, which soon changes to a dark livid brown. At first, they are hard and painful, but their surface soon cracks, and discharges a thin acrid sanies. These tumours sometimes mortify, but more frequently, they communicate with deep-seated abscesses, formed in and between the muscular parts. They have even been found to communicate with the cavity of the thorax. Other eruptions appear occasionally at the same time; not at once, but in successive crops, sometimes as late as the twentieth day. The pustular eruption does not seem to be confined to the surface of the body. It is found in the Schneiderian membrane, in that of the frontal sinuses, mouth, fauces, larynx, and even, it is affirmed, in the mucous membrane of the intestines.

The general symptoms are, great prostration, thirst, frequent tremours, agitation and delirium: and, according to M. Schedel, all the cases of acute farcy glanders, yet on record, have terminated fatally. The discharge from the nostrils is not always apparent, and this has been explained by the matter making its way into the throat, owing to the patient lying on his back.

Examination after death has exhibited the lining membrane of the nasal cavities studded with clusters of small, flat, unequal, white pustules, with irregular ulcerations, and mortified surfaces of varied extent. The septum nasi is almost always ulcerated, and sometimes perforated; and the nostrils and frontal sinuses contain a dark viscid frothy mucus. On dividing the gangrenous tumours, the muscles often appear decomposed: they are of a dark colour; exhale a peculiar fetid odour, and contain specks of purulent matter, with which the muscular tissue appears to be infiltrated. White pustular eruptions, like those in the nasal cavities, sometimes also exist in the mucous membranes of the small and large intestines. Between the muscles, too, large abscesses often form; and lymph or pus is found, at times, in some of the articulations.

Chronic glanders is not, in general, accompanied by any eruption. It is confined to one or the other nostril. At other times, tumours appear slowly and successively on different parts, and suppurate, constituting *chronic farcy glanders*. Sometimes, both affections appear simultaneously in the same individual. The disease does not essentially differ, except in tardiness, from the acute form. Chronic farcy may terminate in acute glanders.

In the acute form, death may occur in a few days; but it more frequently happens about the twelfth day or later. The chronic variety may be protracted for weeks or months, and then terminate in health, or fatally.

Causes.—According to general opinion, the diseased secretion from the glandered horse must be brought into absolute contact, to induce the disease in man; but some believe that it may be received through the air in respiration. It would not seem that glanders is a very contagious disease amongst horses; for the results of observation in France showed, that of 100 horses exposed to contagion, only seven or eight suffered; and on one occasion, when more than 600 glandered horses were collected together at Alfort, not one of the persons who had charge of them was affected in the slightest degree. It would seem, that in Ireland glanders in man is of frequent occurrence, so much so that Dr. Graves (*Clinical Lectures*, Amer edit. by Dr. Gerhard, p. 314, Philad. 1842) thinks the legislature is called on to imitate the wise example of the Prussian government in placing glandered horses under the surveillance of the police. It would not seem, however, that the average susceptibility to the poison is great, as but little precaution is generally taken by grooms and veterinary surgeons.

Cases are on record in which glanders has been communicated from man to man.

The analogy between the disease and that occasioned by the reception of some other morbid poison into the system is striking. Wounds, received on dissection, or from handling the skins of animals that have died under peculiar circumstances, induce cutaneous affections, deep-seated abscesses, and febrile phenomena of an analogous nature, and often prove fatal. (See Anthracion.)

The disease is extremely dangerous, almost hopeless, in its acute form, and full of danger in the chronic.

Treatment.—It is not practicable to lay down any precise plan of treatment. It has been suggested, that the chlorides of lime or soda should be given internally. It has, likewise, been proposed that they should be used as gargles or injected into the nostrils. Turpentine embrocations have likewise been advised, employed as warm as they can be borne, and turpentine has been prescribed internally in small doses frequently repeated. In the chronic form, Dr. Elliotson (*Lancet*, June 20, 1833, and in his *Principles and Practice of Medicine*) found great benefit from the use of creasote. In two cases, he effected a cure in the course of a few weeks, by the sedulous employment of an injection of a dilute solution (creasot. gtti.; aquæ *f.*℥j.) thrown up the affected nostril; combining, in one of the cases, the internal use of the remedy. In one case, which terminated favourably to Mr. Travers, a principal remedy was the frequent exhibition of emetics. Fumigated or medicated warm baths, and the vapour bath, have been proposed by M. Schedel. In all cases, both acute and chronic, much has to be left to the judgment of the practitioner; who must be guided by the phenomena that present themselves. The internal use of iodine, creasote and sulphate of quinia have been advised by M. Delaharpe.

The writer has never met with a case of glanders in the human subject. His description has been, therefore, drawn from others.

Robley Dunglison.]

GLOSSITIS, (derived from γλῶσσα, the tongue,) *inflammation of the tongue*. Although in strictness of language the term glossitis may be applied to the partial inflammations of this organ, frequently induced by the direct application of irritants, whether taken into the mouth with food or drink; of corrosive or acrid substances, or occasioned by mechanical injury, such as the forcible inclusion of the tongue between the teeth, or by friction against the ragged edges of such as may have been broken or decayed; it is nevertheless generally used to denote a specific inflammation either of the substance or coverings of the tongue, or of both, induced through the medium of the system, or sustained by a peculiar condition of the organ itself. Some diseases of the tongue, however, of which inflammation has only been one of the conditions, and others in which all the characteristics of it have not been present, have been occasionally described under this name.

The partial inflammations just noticed seldom require further therapeutic consideration than the avoidance of those causes which may renew irritation, and the removal of others that may continue to exist; the operation of nature under such circumstances being almost always sufficiently sanatory without the interference of art. It must indeed excite surprise, that an organ so constituted, so frequently exposed to the action of irritants, and so often exhibiting changes sympathetic with morbid conditions of other parts of the body, should be so little prone to incur either this or any other idiopathic disease. The little liability to extension of inflammation excited by mechanical or chemical irritants is within proof of every one's experience; but in some instances in which the disposition to scirrhus has been latent, its development has soon followed the inflammation consequent to the injury;—a sufficient reason for inculcating the necessity of avoiding all causes by which it might be aggravated.

The same remarks are applicable to general inflammation of the coverings or substance of the tongue, to which some peculiar predisposing state of the organ itself, influenced probably by a particular state of the constitution, added to that of an inflammatory habit or sanguineous temperament, is conducive. Of the nature of these predisposing causes we are yet ignorant, and rather than waste time in discussing the mere conjectures which have been offered to explain them, we shall avail ourselves of the technicality of science, and include them under the term idiosyncrasy.

The exciting causes doubtless consist of those which are common to inflammations in general, and are such as contribute to repletion, either by food or drink; the suppression of accustomed discharges or of natural secretions, particularly of perspiration, either general or local, from exposure to cold; the immoderate use of stimulating liquors; and the direct application of corrosive or acrid substances. The same mechanical and chemical irritants which we have stated to be exciting causes of partial inflammation may also produce the general affection which it is our present design to discuss.

Idiopathic inflammation of the tongue, or glossitis, is a very rare disease, and very formidable in itself, as well as in reference to its influence on the functions of respiration and deglutition, both of which are in general materially impeded by its presence; the former so much so as to endanger life. It commences with the usual constitutional symptoms common to inflammatory diseases, accompanied with some uneasiness of deglutition; the tongue is rendered painful, and the patient sensible of its enlargement, which is evident on inspection: its surface, at first very red, soon becomes coated, except at the tip and lateral margins, with viscid whitish mucus; the articulation is indistinct, and any attempt to move the organ, or pressure upon it, increases pain: the saliva appears to be profusely secreted, but the inability and disinclination of the patient to remove it from the mouth accounts, in a great measure, for the accumulation and dribbling which are always going on. The local pain increases with the progress of the swelling, which is very rapid; speech and the natural motions of the tongue are consequently more and more difficultly performed; and the augmented bulk, encroaching posteriorly on the space assigned to the passage of air and nutriment, increases the difficulties of respiration and deglutition. The pressure also is a source of irritation to the larynx, and occasions a cough, which under the circumstances of the disease is peculiarly harassing; and the cavity of the mouth being too small to contain the tongue in its increased volume, the organ is consequently protruded. In this state it is obvious that a mechanical impediment must exist to the free course of the blood to and from the head; and from this cause there takes place a throbbing of the arteries, an undulatory motion in the jugular veins, lividity of the complexion, an unnatural prominence of the eyeballs, altogether occasioning an appearance of fulness of the face similar to that consequent to strangulation from any other cause: the accompanying sensations are pain of head, and generally in the ears, vertigo, sometimes indistinct vision, and confusion of mind, or even delirium; considerable pain is also often experienced in the tract of the spinal cord and parts adjacent, from the cervix downwards.

The constitutional or febrile symptoms are influenced by the local affection: the pulse is frequent, full, and hard, but smaller as the disease advances, and as the impediment to respiration becomes greater; the skin, which in the early stage is dry and burning, at length is bedewed with accessions of cold perspiration; there is excessive thirst, the bowels are confined, the urine is red, sparingly secreted, and deposits the lateritious sediment. The patient in this state can rarely sleep, and the irritability of the nervous system rapidly leads to an alarming degree of exhaustion. It occasionally happens that the inflammation is confined to one-half of the tongue, the raphe being the line of demarcation between it and the unaffected side. In such cases the constitutional as well as local symptoms are materially modified; so also are they by a variety of other circumstances, such as the extent of the inflammation, the age and temperament of the individual, and the habit of body which may have immediately preceded the accession of the disease.

The progress of glossitis is like that of other inflammations, and terminates either in resolution, suppuration, gangrene, and change of structure, or conversion into other disease. When the inflammation of the mucous membrane of the tongue has been excessive, the lymph effused has been formed into a distinct expansion, like that which usually is found to take place in cynanche trachealis; and as the tendency is probably always the same, the occurrence, we conceive, would be more frequent but for the constant interruption to its formation, to which, in the mouth, it is necessarily liable. A case of this nature has been recorded by Frank of Vienna, who has referred to a preparation illustrative of the disease in another instance, preserved in the Museum of Hunter. (Acta Inst. Clinici Univ. Viennæ, Anno sec. p. 51.)

The period which glossitis occupies, and its several stages, are very variable in different cases, and influenced by the modifying circumstances already noticed, as well as by the remedial means which may have been adopted. Its disposition to terminate in resolution is in some cases manifested so early as the second or third day, but seldom before the fifth or sixth. The indications are, a progressive diminution of the morbid bulk of the tongue, and of the pain accompanying it; its surface becoming moister; the thick coat with which it was covered disappearing; a progressive return of power and inclination to use it; with a proportionate decrease or even cessation of febrile symptoms, as well as of those stated to be consequent to plethora in the vessels of the head.

To illustrate the progress of the disease, and its auspicious termination, we subjoin a short sketch of a case described by the writer just alluded to.

A healthy youth, nineteen years of age, was suddenly attacked with febrile symptoms, together with pain in the head and throat, difficulty of deglutition, and cough: these having been neglected, increased, and during the night he experienced very acute pain at the end of the tongue, increasing in extent and severity with its progressive swelling, which was rapid and considerable, filling the whole cavity of the mouth, and rendering him unable to articulate. The following day he complained of pain in the head, especially towards the forehead, with increase of sensibility of the eye to the impression of light; the tongue was remarkable for its red colour, increase of size, rigidity and heat; the patient could neither draw it inwards nor extend it; the sublingual glands and tonsils were tumefied; he was incapable of speech and deglutition; complained of great thirst, had a dry burning skin, and a frequent strong pulse. Copious perspiration of a sour odour came on in the night, the swelling of the tongue and tonsils subsided, and with it the febrile symptoms; the tongue became moist, deglutition easy, and the following day restoration to health seemed to be established.

Suppuration succeeding to glottis is indicated by some diminution of excitement of the system, with an accession of coldness over the surface of the body, or a distinct rigor, the local pain being somewhat diminished if the abscess be superficial, but the swelling increasing, and at no distant time, in one part or another, becoming particularly prominent. Under the same circumstances the appearance at the pointing part differs from that of the surrounding structure, and to the sense of touch it is soft and elastic, showing plainly the existence of an abscess, which, if not artificially opened, at length by natural process allows its contents to escape. When, however, the pus is deeply imbedded in the substance of the organ, there being little cellular membrane in the construction of the latter, it separates the parts in proportion to the quantity secreted without diffusing itself, and therefore acts as a wedge, and, from the condensation and sensibility of its structure, the organ is little if at all relieved, as usually happens in most other parts by the effusion of this fluid. By active treatment, however, adopted in the early stage of the disease, suppuration may generally be prevented; but when the presence of pus is ascertained, no time should be lost in relieving the organ of it.

The termination of glossitis in gangrene is a very rare occurrence, and has happened only in constitutions extremely debilitated by intemperance or disease. The reduced state of the vital powers manifested in the feeble performance of the general functions of the body, and the blackened appearance of the tongue, the peculiar odour, and loss of sensibility, of pain, and of heat, will denote the morbid changes in progress. It has been remarked that the separation of the mortified from the living parts has been particularly rapid when gangrene has taken place in this organ.

A careful consideration of the symptoms of idiopathic glossitis already detailed will afford the readiest index to determine its presence, and to distinguish it from symptomatic inflammation, as well as from other morbid states. The connecting links between local injury and consequent inflammation can be too easily traced to admit of error; and the enlarged states of the tongue arising from the specific operation of mercury, and sometimes consequent to the absorption of particular poisons, are attended with symptoms too peculiar to themselves, and not sufficiently characteristic of idiopathic glossitis, to render any discussion on their diagnostic distinctions necessary. The same remark is applicable to the tumefactions of the tongue which sometimes occur in fevers of a malignant type, as in typhus and variola; or those metastases of inflammation which, though most rarely indeed to this organ, have been found to occur in arthritic and rheumatic cases with its simultaneous subsidence in the part originally affected.

Idiopathic glossitis must at all times be considered a very formidable disease, and the degree of danger, in a previously healthy subject, will be proportionate to the obstacle which the tumefied organ may present to respiration, and to the opportunity which may be offered of subduing the inflammation on which it depends. From active treatment in the early stage a favourable issue may reasonably be anticipated, particularly if a mitigation of symptoms is seen to follow the successive application of remedial means; but if the disease be neglected in the early stage, or the volume of the tongue increase, in resistance to the measures resorted to, respiration will be performed with proportionably greater difficulty, threatening extreme danger to life by suffocation; and in persons predisposed to apoplexy or other cerebral disease, in an additional degree, by the impediment occasioned to the free return of blood from the head, and the consequent aggravation of these diseases. Diminution in the volume of the tongue, whether by artificial means directly applied, or through the medium of the system, will proportionately subtract from the danger and increase the rational hopes of recovery; but if the inflammation should have proceeded to gangrene, the danger to life will be influenced by the probability presented by constitutional circumstances of arresting its progress, and, when effected, by the extent of the mortified part: the tongue being the organ of taste, and necessary to the perfection of speech, of mastication, and of deglutition, these functions will be affected commensurately with the local destruction.

When suppuration has taken place, and the bulk of the tongue is diminished by the natural or artificial evacuation of pus, and the distress of the system lessened by a freer state of respiration and circulation, a recovery may fairly be anticipated; but the proneness in this organ to the development of scirrhus, in constitutions predisposed to it, is a circumstance which the practitioner should be prepared to meet after this or any other excessive local irritation.

Treatment.—The rapid progress of idiopathic inflammation of the tongue, arising spontaneously in a subject previously in good health, and not induced by the action of poisons or mercury, renders it of great importance that the antiphlogistic regimen should be early adopted and actively pursued. Bleeding from a vein in the arm, in proportion to the excitement of the system, or from the external jugular vein when the brain is oppressed or likely to suffer, should be immediately resorted to, and repeated a second or even a third time, at intervals of eight or twelve hours, until the inflammatory action of the system be subdued; other means having been adopted in aid of the same intention. Leeches should be applied in considerable numbers to the tongue itself; and when the oozing of blood has subsided from their wounds, a piece of ice, or very cold water, should be frequently applied. Active purgatives, such as calomel and jalap, or sulphate of magnesia with infusion and tincture of senna, must be given without delay, and their operation aided by a stimulating enema: indeed to keep up the free action of the bowels, so essential in the treatment of this disease, a frequent repetition of this remedy will be necessary if purgatives cannot be swallowed; and, under more favourable circumstances, their counter-excitant action being immediate, they are calculated to prove highly advantageous. The usual diaphoretics and diuretics will be useful adjuvants in effecting the end in view; and, from the small bulk in which they may be given, digitalis and tartarized antimony are to be preferred. Immersion of the feet in hot water, or in some cases even a general hot bath might be prescribed with advantage. A blister should be early applied across the throat, extending nearly round the inferior margin of the lower jaw, as far as its angles.

When respiration is so obstructed by the augmented bulk of the tongue that its increase or continuance threaten to impede it entirely, two or three deep scarifications must be immediately made from the base to its apex, taking care to avoid the arteriæ raninæ, for the means of suppressing excessive hemorrhage from them would probably excite a degree of irritation which would counter-balance the advantages consequent even to a moderate loss of blood.

Several instances of the advantage of incisions in extreme enlargements of the tongue have been transmitted to us by M. de la Malle. (Mém. de l'Acad. de Chirurgie, vol. v.) Camerarius has recorded a case in which the patient was rescued from impending death by this operation; and Zacutus Lusitanus, another of a child, ten years of age, where the usual remedies had failed of affording relief, and the symptoms yielded to deep scarifications. Job a Meckoen, a Dutch surgeon, who lived in the seventeenth century, (Dict. des Sciences Méd. Art. *Glossite*,) adopted this practice on several occasions with the most complete success; and it is probable, as Mr. Samuel Cooper has remarked, that a fatal issue from suffocation, subsequent to various kinds of enlargement of the tongue, might in many instances have been averted by its timely adoption. In the twenty-eighth volume of the Edinburgh Medical and Surgical Journal, page 77, an interesting case of the disease is recorded, in which the free use of the scalpel was attended with the best effects; allowing an exit for puriform matter. In the twenty-first volume of the same work, page 235, there is another case, illustrative of the advantage of incisions of the tongue, in a case of its inflammation, apparently consequent to suppression of the menstrual discharge from exposure to cold.

It must be acknowledged, however, that incisions are not always successful; and it may be of importance to the practitioner's credit in proposing an operation which at least has the appearance of extreme severity, that he should advise it as essential in the urgency of the patient's circumstances, and the most conducive, though by no means a certain step to his recovery. An example of the inefficacy of this and several other therapeutic agents in a case which proved awfully rapid, terminating fatally within forty-eight hours from its commencement, was detailed in the second volume of the Lancet for the year 1827. It occurred in the Winchester Hospital, and had the advantage of the attendance of an eminent surgeon of that establishment in a little more than twelve hours after the earliest symptom of the disease.

If incisions should fail in producing the anticipated relief, there yet remains an alternative by which life may be sustained and an opportunity provided of conducting the disease to a favourable issue: we allude to the operation of bronchotomy, for the success of which in a case of this kind we have the recorded testimony of Mr. Benjamin Bell. The tongue had been alarmingly swollen from the excessive action of mercury, and no relief was obtained, although a variety of remedies had been used, until an opening was made into the trachea to keep up artificial respiration. With the same view Desault would have preferred the introduction of an elastic gum catheter from the nose into the trachea, (Œuvres Chir. de Desault, par Bichat, tom. ii. p. 406); a method, we conceive, which the preternatural irritability of the parts in particular instances can alone render objectionable.

It will be inferred from our preceding remarks, (and the state of the patient will dispose him little to regret the privation,) that in the early stage of the disease, when the excitement is considerable, stimulating food and drink should be prohibited; it will also be necessary, of course, that the food should be in a soft state, and that both the food and drink should be cool, bland, and unirritating. In some instances the impediment to deglutition may be so great as to make it necessary to administer both medicine and food through the nose by means of a canula passed into the gullet; and in circumstances requiring such a measure, nutritive injections may be had recourse to.

When the inflammatory stage of the disease has been subdued, and the tongue is assuming its natural appearance, little else will be necessary than care to avoid the direct application of irritating and acrid substances; and, if need be, the restoration to a healthy state by the remedial means severally proper in the particular conditions of those organs the defective actions of which may have served to promote the accession or violence of the disease.

When suppuration has taken place, or is about to do so, it will be necessary to relax in the pursuance of antiphlogistic measures, and, as soon as possible, to make a free aperture for the escape of pus, with a lancet or scalpel. From the observations we have already made on suppuration in this organ, it will be understood that a deep incision may often be necessary to reach the cavity of the abscess. A striking illustration of this has been recorded in the Glasgow Medical Journal, by Mr. Orgill, with other instructive cases of the disease. The patient, a farmer, fifty years of age, had suffered for some days from glossitis, and besides other treatment had undergone local bleeding by cupping and leeches, as well as two incisions *half an inch deep* from as far as the scalpel could be made to reach to the tip of the tongue. The incised wounds bled freely, and the swelling was a good deal reduced, but in the evening of the same day it became as great as ever; it was scarified still more deeply, and a castor-oil enema prescribed; this also gave great relief; but next morning the swelling had returned, with a peculiar lividity at the tip of the diseased half of the organ. An incision *an inch deep* was made with a scalpel, which gave exit to a gush of pus in a very offensive state, and in eight days the patient was well. The sensibility of the organ on the affected side remained imperfect for a year afterwards, but at length was restored.

When the tongue has been relieved of the painful distension occasioned by the impaction of pus, the sanatory quality of the saliva may generally be relied on for the completion of the process of cure. Astringents in most cases will be unnecessarily stimulating, but a simple admixture of honey and barley water, or some gargle equally unirritating may contribute to the patient's comfort by diluting the saliva, and thus forming a cool and more bland application. On some occasions it may be requisite to have recourse to other detergents, such as borax or tincture of myrrh in the common form of gargle.

The indications as to constitutional treatment in this stage are, to allay the irritability of the system, and to restore the disordered functions of the body to their healthy state. As the means must be selected on general principles, it would be needless to particularize them here.

When inflammation of the tongue has unfortunately terminated in gangrene, — a very rare occurrence in this rare form of disease,—its treatment is subject to the same laws as gangrene in any other part: reliance, however, is chiefly to be placed on the means of improving the condition of the constitution; though it is to be feared that in most instances there can be little probability of effecting this object. For the particular means we refer to the article Inflammation, rather than occupy time and space unnecessarily by any formal detail on a subject which has little notice in the records of medical literature, probably because science has been unavailing in the few opportunities which have occurred for its application.

The enlargements of the tongue, (some extraordinary instances of which are on record,) which have been occasionally consequent to the exhibition of mercury, usually yield to purgatives, or injections of the same nature, bleedings, and the discontinuance of the mercurial medicine. In some cases of extreme obstinacy it may be requisite to make incisions into the organ, or to adopt the other means of treatment which have been proposed: other particulars relative to this state will be discussed under the article Ptyalism.

In those tumefied states of the tongue which occur in typhoid and variolous fevers attended with an atonic condition of the system, the local affection requires little consideration apart from the general disease, unless, indeed, the magnitude of the organ should threaten suffocation; when free incisions, in the manner we have already described, and the other mechanical means pointed out, may materially relieve, if not save the patient from impending death.

In such instances as are the results of metastasis, as of gout or rheumatism, the first step will be to invite the inflammation to its original seat, by applying to the latter a sinapism or blister, or by immersion of the extremity in which it may have been situated in hot water, rendered still more stimulating by the addition of flour of mustard or common salt: should this fail in producing the desired effect, or if the habit of the individual should be favourable to the continuance of inflammation, the method of subduing it must be adopted at the same time, bearing in mind that under such circumstances the local affection will partake of the same peculiarities, and require a corresponding consideration, with the general disorder.

[When the surface of the tongue is covered by a dry, white pellicle, and is ulcerated or perforated, a condition which has been described by Dr. Marshall Hall as *psoridsis of the tongue*, (*Principles of the Theory and Practice of Medicine*, p. 468: Lond. 1837,) it is necessary, as in chronic cutaneous affections in general, to act on the general system. This can be done by eutrophics, in other words, by agents that modify the condition of the system of nutrition,—of which arsenic and iodine are among the best, especially if given in syrup, which, of itself, is capable of modifying the chyle, and, through the blood, the nutrition of the tissues. At the same time nitrate of silver may be applied to the tongue itself.]

W. Kerr.

[GLOTTIS, ŒDEMA OF THE, (See Laryngitis.)]

GLOTTIS, SPASM OF THE. This very formidable affection, which is by no means of rare occurrence in infancy, was till of late years but ill understood, being for the most part confounded with croup and other inflammatory affections of the air-passages. One of the first obscure notions of it is that by Millar, under the name of the acute asthma of infants. He seems, in some respects, to have confounded it with the first stage of croup; and yet, if early discovered, he thought it might always be cured by the plentiful exhibition of assafœtida, and the subsequent employment of bark.

A further step towards the diagnosis of the disease was made by Underwood, in his division of croup into the chronic or spasmodic and the acute or inflammatory. The former of these, which seems to answer to what is now called spasm of the glottis, he states to have been known to continue so long as two months, and then to have yielded to opium. "Instances have likewise been met with of children crouping for two or three days, and being then seized with hooping-cough, which has instantly removed the croup. These circumstances," he continues, "seem to prove that species of croup to be truly spasmodic. I have seen it frequently in this form attend the cutting of teeth, being then the mere consequence of irritation, as we see cough and various other symptomatic affections induced at this period." In addition to assafœtida and bark, Underwood recommends the occasional use of emetics and cicuta — "one or other of which must be persevered in as long as any symptom of the disease, and particularly the croaking noise, shall remain. He seems, however, to have had but a very imperfect notion of the disorder, confounding it in one part of his work with croup, with which it has really no affinity, the membrane lining the larynx presenting no traces of disease on dissection; and treating of it in another place under the head of inward fits, which is an imaginary disease. Dr. Ferriar, likewise, in recognising a spurious species of croup, seems to have met with the affection in question, though he did not attain to a correct idea of its nature.

One of the first accurate accounts of the disease is that by Dr. John Clarke, in his Commentaries on the Diseases of Children. He describes it under the name of "a peculiar species of convulsion in infant children," often miscalled spasmodic or chronic croup. The child, according to this writer, is suddenly seized with a spasmodic inspiration, consisting of distinct attempts to fill the chest, between each of which a squeaking noise is often made; the eyes are staring, and the child is evidently in great distress. The face and extremities, if the paroxysm continue long, become purple; the head is thrown back and the spine bent, as in opisthotonos; at length a strong inspiration takes place, a fit of crying generally succeeds, and the patient, much exhausted, falls asleep. The paroxysm may occur often in the course of the day, and is most apt to take place on awakening, or on exposure to slight causes of irritation. If neglected, it may go on recurring frequently for two or three months, until at length general convulsions ensuing, the parents become alarmed. It seldom occurs, he thinks, after the third year, or in children who have lived by suckling alone till they have got some of their teeth, and thus escaped those derangements of the health which are connected with an unsuitable diet in extreme infancy. This, as well as other convulsive affections of children, he ascribes to disease of the brain, which may be induced, he thinks, by over-feeding, keeping the head too hot, the sudden cure of ophthalmia, or of cutaneous eruptions, the occurrence of fevers, &c. In one fatal case he discovered, on dissection, both fulness in the vessels of the brain and water in the ventricles.

A peculiar species of hydrocephalus, ushered in by spasm of the glottis, has been mentioned by Monro; and a case which seems to have been of this kind is also alluded to by Underwood. Gölis, in treating of the predisposing causes of hydrocephalus, places this affection amongst them, and describes it as "a peculiar disorder of respiration, in which infants after sudden waking out of sleep, or from terror or anger, often too without any cause, are suddenly seized with a deep shrill respiration, which for many seconds, sometimes even for minutes, threatens suffocation; the whole body becomes stiff; the face, hands, feet, and particularly the finger and toe-nails black or blue, and the little patients lose their breath and consciousness; at length, however, with a cry of alarm, they again recover both."

Dr. Cheyne has given, in the following passage from his work on hydrocephalus, a more satisfactory account of this affection, since called spasm of the glottis, than any of his predecessors: — "Another disease of infancy required to be briefly adverted to in treating of the diagnosis of hydrocephalus. This disease has been known to some authors under the titles of inward fits, chronic croup, &c. It begins with a crowing inspiration, like that which takes place in the commencement of a paroxysm of pertussis. As at first there are long intervals between these spasmodic inspirations, (several days perhaps;) as they appear to be connected with a disordered stomach and absence of bile in the bowels; to arise from sudden exertion, or fits of passion; and as the child often continues to thrive notwithstanding, the disease is not much attended to. At last, however, the spasmodic inspirations excite just alarm; they occur frequently without any apparent cause, when the child is perfectly tranquil; the complexion becomes purple, insensibility follows, and not unfrequently universal convulsions or rigidity of the muscles, with the thumbs clenched in the hands: these convulsions, in seven instances to my knowlege, have ended in death. However, after continuing many weeks, or even months, this affection often terminates favourably with the cutting of one or more of the teeth, or it may be relieved by effectually scarifying the gums, changing the air and diet, and alternating mercurials with carminative purgatives. The pathognomonic of this disease is a crowing inspiration with purple complexion, *not followed by cough*. In some cases this affection is attended not merely with a permanent clenching of the hand upon the thumb, but also with a very remarkable fixed spasm of the toes, particularly the great toe, which gives a look of swelled deformity to the upper part of the foot." For a further account of this peculiar swelling of the hands and feet, first accurately described by Dr. Kellie, the reader is referred to the article Dentition, Diseases of. [The presence of these symptoms has given occasion to the names *carpo-pedal spasm*, and *cerebral spasmodic croup*.]

Spasm of the glottis cannot be considered a rare disease, as Cheyne had seen previous to the year 1819, when his work was published, no less than twenty cases, of which one-third were fatal. He, like Clarke, has no doubt that the brain is the seat of the disease; but what is the precise morbid condition of this organ giving rise to these peculiar symptoms, or whether there be any invariable one, has not yet been accurately made out. The results of dissection in three cases are given in the appendix to this work. In the first of these, two tumours, apparently of a scrofulous nature, were found imbedded in the substance of the brain; in the second, the convolutions were nearly obliterated, and the cerebral substance appeared uncommonly firm; in the third, the veins on the surface of the brain were turgid with blood; a considerable quantity of serous fluid existed between the tunica arachnoides and the pia mater, giving a gelatinous appearance to the surface of the hemispheres; whilst about an ounce of water was discovered in the ventricles. Disease of the brain has not, however, always been detected. Thus in two cases mentioned by Dr. Merriman, of children who died in these fits, no appearance of cerebral affection could be discovered. The principal deranged structure was a collection of small glandular swellings in the neck pressing upon the par vagum. In none of these cases was there any trace of inflammation in the larynx or trachea.

Gardien's description of this affection, under the title of "Spasme du Thorax et de la Glotte," differs in some respects from most other accounts of it. He remarks on the impropriety of many of the names which have been bestowed on it. Thus by Lieutaud and Baumes, who seem to have had a pretty accurate idea of its true nature, and its alliance to convulsive or nervous affections, it has been absurdly called "catarrhe suffocante." The appellations of "acute asthma of children," employed by Millar, or spasmodic asthma, used by Rush, appear to him equally objectionable. The disorder, as described by Gardien, consists in a spasm of the diaphragm, muscles of the chest and larynx, and is, he thinks, almost always fatal, if suitable remedies be not employed during the commencement of the disorder. It occurs chiefly in children, though in some rare instances it has been observed in adults also, chiefly in nervous women and old persons. The night-mare, or a habit of suddenly awakening from sleep in a state of terror, he looks upon as a premonitory symptom, or as the first stage of the disease. Children who are liable to it are observed to cry very frequently during the day, and are frightened and agitated by the slightest causes. Its attacks are sudden, and occur chiefly in the night. The appearance of the face during the continuance of the spasm is variable; in some instances being pale as in syncope, whilst in others it has an apoplectic character. It occurs most frequently, he thinks, between two years old and seven; in which he differs from most other writers, as it is usually placed amongst the diseases of early infancy and of dentition. Children who are old enough to explain their sensations complain of a feeling of suffocation and constriction about the chest, as if it were bound with cords, and of palpitations and convulsive efforts of the thorax, with a sense of strangling about the larynx; the respiration is sometimes momentarily interrupted, and is at all times extremely difficult, and accompanied with a peculiar sound, which can be heard at a considerable distance. The stomach and intestines are distended with air, and the patient seems as if he would die of suffocation, if eructations or vomiting did not come to his relief. His description, in some of its parts, suggests to us the idea of an hysterical affection. Spasm of the glottis, as already stated, has also been mentioned by Dr. Merriman. He thinks it by no means an uncommon affection of children, and attributes it chiefly to improper food and close and confined apartments.

Wichmann, the Hanoverian physician, and Schmalz, in his work on diagnosis, have taken peculiar pains to point out the distinctions which exist between this disease and croup. The latter seems usually to depend on a cold damp air and sudden atmospheric vicissitudes; its inflammatory nature is manifested as well in the character of its symptoms, as by the beneficial effects of antiphlogistic treatment, and by the appearances on dissection. Spasm of the glottis, on the contrary, is excited by passions of the mind and other sources of momentary irritation, existing often in distant parts of the body; catarrhal symptoms form no essential part of the disease; it occurs chiefly in those who have a general disposition to convulsive affections; its attacks are intermittent, and are most susceptible of relief from agents acting on the nervous system; and it presents after death no traces of inflammation in the respiratory organs.

Spasm of the glottis has been described by Mr. Pretty in the Medical and Physical Journal under the singular name of "*cerebral croup.*" It has also been noticed by Richter, Henke, Jahn, and several other writers in Germany. [Of late years it has attracted more attention, and by many of the German and other writers has been termed, in consequence of their views of its pathology, *Asthma thymicum, A. thymicum Koppii*, and *Laryngismus stridulus*,] and in France it has been treated of by Guersent under the title of "*pseudo-croup nerveux.*" Though it has been thus recognised by so many respectable authorities as a distinct and well-characterized disease, yet Autenreith and Hecker, and more recently Jurine and Albers, have treated it as a mere modification of croup. From this, however, we repeat, it is broadly distinguished, as well by its intermittent nature as by the usual absence of cough and fever, and by the sudden death which not unfrequently occurs in it. Even if a slight cough happen to co-exist, the disease may still, as Dr. Hamilton has remarked, be satisfactorily distinguished by the cough not being a peculiarly hoarse one, and by the breathing in the intervals remaining perfectly free.

The latest and by much the best account of the disease, is that by Dr. Marsh. The disorder, as described by this writer, begins by the muscles of the glottis; but if neglected or mismanaged, it may extend to those of the extremities, and even terminate in universal convulsions. Its occurrence is by no means rare, and its result not unfrequently fatal. It sometimes appears to be a purely idiopathic affection; but in far the greater number of cases, as Dr. Marsh observes, "it is complicated with painful dentition, derangement of the digestive functions, a cachectic state of the system induced by an impure atmosphere, fever, and occasionally with effusion into the ventricles of the brain. The child is observed to awake suddenly from sleep in a state of alarm and agitation, to struggle for breath, and, after repeated efforts, to recover from the paroxysm with a long and sonorous inspiration," usually described by nurses as a whoop or crowing sound. The face is swollen and purplish during the fit. As the disease advances, similar attacks occur even while the child is awake,—"sometimes without any perceptible cause, but more frequently when it is vexed and about to cry." Robust as well as delicate children are liable to it, but it especially attacks those which are of a passionate and irritable disposition, and the subjects of it are observed to be easily startled even by the slightest noises. It is only in its more advanced stage that Dr. Marsh has observed the peculiar swollen state of the hands and feet, and the rigid contraction of the thumbs and toes, already alluded to.

[We have much to learn in regard to the **pathological characters.** It has been thought to be, in the first instance, a spasmodic affection of the muscles of the glottis, and that until the disease has increased in severity, and general convulsions have supervened, the brain or its meninges do not become the seat of disease. The seat of the primary lesion has been presumed to be in the brain. By others, the disease has been referred to hypertrophy of the thymus gland, producing pressure upon the heart, lungs, and great vessels, and it has been maintained to be owing to the enlargement of the bronchial or deep-seated lymphatic ganglions of the neck, pressing upon the recurrent nerves, and inducing paralysis of the muscles supplied by them. (Ley, *An Essay on the Laryngismus Stridulus*: Lond. 1836.) Judging from the character of the phenomena, the disease would seem to be primarily and essentially encephalic; and it has been suggested by Dr. Marshall Hall, that even the enlargement of the thymus gland, which is sometimes met with, may be "a natural effect of the violent convulsive efforts observed in this terrific malady."]

In the **treatment** of the disease the chief indications consist in removing any complications which may exist, and in improving the general health, and especially the tone of the nervous system. Difficult dentition is a very frequent exciting cause of this affection: when it is suspected to have this origin, the swollen gums must be immediately divided. In those cases where a careful investigation into the state of all the functions of the body detects no complication, a mildly tonic plan of treatment should be had recourse to. The sulphate of quinine, or some of the mineral tonics, are here found very useful. Antispasmodics too often disappoint expectation, and are of very secondary importance in the treatment of the disease: ether and ammonia are the only medicines of this class in which Dr. Clarke had the slightest confidence. The tinctura fulginis of the older pharmacopœias is spoken of by Dr. Marsh with some commendation. In all cases we should endeavour to improve the general health and strengthen the nervous system by country air, a well-regulated diet, and attention to the state of the bowels. By giving the child the advantage of a pure air and of a succession of good nurses during the whole period of dentition, more good has appeared to be done than by all other measures put together. Dr. Marsh remarks that all his cases occurred in children of a scrofulous constitution; a fact which leads him to insist still more strongly on the importance of a pure atmosphere, healthy nutriment, and tonics. Dr. Cheyne, also, as we have seen, dwells much on the utility of change of air and of diet. Free exposure to the open air, and daily sponging of the body with cold water, are amongst the most effectual means we possess for lowering the nervous excitability in this and many other spasmodic disorders.

When the convulsions threaten to become general, leeching the temples, cold applications to the head, and fomentation of the extremities, will generally be required. In the case of a delicate child of two years old, mentioned by Marsh, in which the paroxysms were of very frequent occurrence, and were accompanied by general convulsions, a tobacco enema (five grains infused in six ounces of water) was administered; it produced its specific effect in a very marked manner, and no appearance of convulsions was observed for a month after. Removal to the country appeared to confirm the cure. The symptoms, however, recurred on again returning to town to a house which had been recently painted. Several other instances are mentioned, where the disease seems to have been excited by the unhealthy atmosphere of newly painted rooms.

Dr. Merriman is of opinion that this disease, when early attended to, will commonly yield to aperients, so given as to procure at least two copious evacuations daily, together with the continued use of soda, or a strong infusion of burnt sponge, and proper attention to the diet and regimen:—"When the head is manifestly affected, cupping-glasses behind the ears are required; but when the patient has cold, pale, flabby cheeks, abstraction of blood is rather injurious than beneficial." Dr. Hamilton has found Dalby's carminative a useful medicine in this affection after the bowels have first been freely opened. We have known the disorder, after resisting the influence of purgatives and change of air, cease finally on the occurrence of a spontaneous diarrhœa.

Spasm of the glottis has occasionally been mistaken for an inflammatory affection of the lungs or air-passages, and been much exasperated by a consequent perseverance in the antiphlogistic treatment, and by confinement to the close air of a heated apartment. Even in its simplest and mildest form it should never be neglected, as in the absence of every complication, the spasm of the muscles of the larynx alone has often proved suddenly fatal. Dr. Johnson knew a case recovered by the immediate employment of artificial respiration, after death had apparently taken place.

Before terminating this article, we may state, that fatal spasm of the glottis in adults occasionally takes place, under the influence of irritating causes in the neighbourhood of the larynx. Thus, in an interesting case recorded by Mr. Kirby, spasm of the glottis and death were caused by the irritation of a mouthful of food sticking in the œsophagus; and we have seen a patient with many of the symptoms of acute laryngitis die rather unexpectedly, when, on dissection, very little if any redness or swelling were discovered in the membrane lining the larynx, and scarcely any other morbid appearance than one or two minute ulcers. It is probable that the fatal result, as well as the sonorous breathing, and many of the other symptoms in such cases, depend on a spasmodic contraction of the glottis.

W. B. Joy.

GOUT, *gutta*, *la goutte*, a drop or defluxion. A name is of slight importance, provided it does not mislead by imputing to a disease a hypothetical character. If used only to express the individuality assigned, for purposes of convenience, to an aggregate of functional disturbances or structural lesions, and limited to this sense without involving any speculative conjectures respecting the cause or nature of disease, it need not be rigidly criticised. That which heads the present article, while it is one of the most ancient, being traceable so far back as the thirteenth century, and the most generally adopted, a corresponding term having found its way into all the languages of Europe, is also the one in common use to designate the disease; and as the false theory which gave rise to it has been long exploded, and is now incapable of biassing any one's judgment, it seems little worth while to change it for any other, especially as, of the substitutes introduced or proposed, none is so unexceptionable as to entitle it to a preference.

An elaborate treatise on gout would be unsuitable to the present purpose, while it would be valueless if it could be introduced. To record all that has been said in the lapse of centuries would be wearisome labour to the writer, and profitless to the reader. Much has been written which may well be passed over. The facts are few, the speculations many, and these too often the mere phantasms of the brain. The former are the same now that they ever were, and therefore cognizable by every observer; and far better is it to study them in the book of nature than to take them on trust from any authority, however high: the latter have produced but little worth remembering; theories have chased each other like shadows in a magic lantern, none abiding to announce to us the essential nature of gout. After ages of inquiry, we know it only by the order and character of its phenomena, and have yet to learn its intimate nature or the special cause which produces it. Happily the knowledge within our reach is sufficient to guide us to much useful practice, as well in averting accessions of the malady as in mitigating them when they do occur, and in preventing the disorganization and decrepitude to which gout, when neglected or maltreated, so often consigns its miserable victims. If, from our inability to penetrate nature in her inmost recesses, we cannot detect the essence of gout, we can at least note the succession and character of the phenomena which constitute it; we can mark the deviations from health which precede and attend the attack, and by contrasting them with the healthy condition, can arrive at some knowledge of what is amiss: we can thus direct our efforts to restoring healthy function where this is sensibly impaired, and by so doing can second the efforts of nature in remedying the special disorder, even when ignorant of what essentially produces it. In fine, by adopting a pathology founded solely on facts, unalloyed by hypotheses, and conformable to all that we know of the physiology of animal life, we may establish a system of treatment supported by rational principles, and capable of rendering much more valuable service to those who need our assistance, and look to us for relief.

We have it in our power in a great degree to avert the accession of the gouty paroxysm by correcting that state of the constitution which ministers to it; we can greatly mitigate the sufferings of the attack, abridge its duration, and prolong the period of exemption; by so doing we can prevent those horrid disorganizations which protracted or oft-renewed gout so constantly occasions, and also obviate still more fatal consequences which result when gouty action extends to vital organs and other parts essential to well-being. The brain, lungs, heart, stomach, liver, kidneys, may any or all participate in the derangements occasioned by unrelieved or maltreated gout; and the sufferings and danger which thence result may be numbered among the most formidable to which disease can subject the animal frame. Palsy, epilepsy, gravel, and other direful inflictions are too often the attendants on protracted gout, and intensely do they aggravate its sufferings. These views are hastily sketched, for the purpose, not of magnifying the disease or attaching to it any undue importance, but of claiming for it that scrutinising investigation, vigilant observation, and sober judgment which may bring its practical treatment within the pale of rational principles, and divest the subject of the mysticism which has been too long suffered to surround it, to the discredit of medical science and the encouragement of charlatanry.

On no subject has empiricism been more assiduously or more mischievously pursued; and where its nostrums have not proved absurd from their inertness, they have been too often pernicious from their activity: witness the numberless victims who fell a sacrifice to the delusive efficacy of the eau medicinale. Until the treatment of gout shall be established on the same principles which are found applicable to all other diseases; until the contemplation of its inscrutable, or at least undiscovered, essence shall be superseded by a fixed attention to its obvious and intelligible phenomena, and the proper treatment which these demand be adopted generally and systematically by the profession, quackery will continue to practise its deceptions, and gouty sufferers, hopeless of relief from the regular practitioner, to surrender themselves the willing dupes of every confident pretender.

A history of gout that would comprise all its alleged forms and modifications would be both tedious and uninstructive; nay, instead of elucidating, it would but obscure the subject, involving it in inextricable confusion. Much that has been attributed to gout belongs not to the special disease so much as to incidental derangements, either antecedent to, coincident with, or resulting from it, and no more an integrant part of gout than when they occur in connection with any other malady. The incidental derangements of a gouty habit are numerous enough, and often to be met with; but it can serve no good purpose to represent all these as characteristic of gout, which, on the contrary, will be best and most clearly comprehended when viewed in its natural form, divested of those complications which, however occasionally intermixed, do not necessarily belong to it. It has been too much the custom to attribute every morbid action occurring in a gouty habit to the influence of gout; and, however obvious their nature or character, to render their treatment subservient to the notions of gout which the medical attendant chanced to entertain. In this way have the apprehension of debility, the belief of a tonic treatment being requisite in gout, and the fear of injuring the constitution by any interference with the gouty paroxysm, misled many into pursuing a stimulant regimen under circumstances which, but for this delusion, would have been seen to indicate a very opposite course; and to the conflicting experience derived from observations made under such misconceptions, may be ascribed much of the uncertainty and caprice which mark the treatment of gout, both popular and professional, even at the present day.

The best history of gout for all useful purposes must be that which represents the disease in its simplest form, giving such a description as will enable the young practitioner to recognise it when presented to his view. This being illustrated, and the principles of treatment explained, the various modifications may then be advantageously discussed in connection with the derangements which occasion them, and with the treatment which they respectively require; in which course of inquiry, it cannot fail to be remarked how much this treatment is dependent on the same general principles which guide the practice in all other diseases, and how very little consideration it admits for the special nature or character of gout.

The definition of Cullen characterizes the disease clearly and succinctly. "Morbus hereditarius, oriens sine causa externa evidente, sed præeunte plerumque ventriculi affectione insolita, pyrexia, dolor ad articulum, et plerumque pedis pollice, certe pedum et manuum junturis potissimum infestus, per intervalla revertens, et sæpe cum ven triculi et aliarum internarum partium affectionibus alternans." That this as a definition is open to objections we admit. As a description of the disease, however, at once concise and correct, it seems to answer every purpose; and we are not aware of any preferable or less exceptionable character of the malady having been yet proposed. The object of a definition is so to characterize a disease that the name used to denote it shall be applied always to the same morbid condition. But it is a general character only that can be thus assigned. Perfect accuracy is not within the compass of any definition; and it is fruitless to cavil at imperfections of nosology, when of the branch of science which classifies disease the very foundations are yet undeterminate. It may be confidently alleged that of all the methodic classifications yet proposed, not one rests on a stable basis; and both physiology and pathology must be greatly advanced ere any arrangement bordering on a natural and scientific classification of diseases can be practicable. The derangements of the constitution which usher in diseases, the local disturbance to which they give rise, and the re-action by which these aggravate and complete the disordered state in which they originate, are too little understood for any classification of diseases founded on their essential nature or character to be yet attempted. To the labours of the pathological anatomists now so diligently pursued, and to the lights which these shed on morbid actions, and the lesions which result from them, must we look for guidance in this respect if the object is ever to be attained. So unsettled are opinions respecting diseases of the most frequent and extensive occurrence, that it is yet disputed whether fever is a local or constitutional disease; and this ambiguity is likely to endure so long as consideration of diseased conditions of the frame is taken up at the advanced period at which a nosological disease presents itself, without sufficient regard being had to the previous deterioration of health to which so many of these morbid conditions are traceable, and without a clear knowledge of which their nature and progress never can be thoroughly understood.

Much of the complexity displayed in any minute history of gout results from several circumstances being comprised which do not essentially belong to it. Left as it has been to work out its own cure, derangements have ensued in its unchecked progress, which a more efficient treatment of the incipient disease would have wholly prevented, and which should, therefore, be considered rather as contingent and derivative than as forming a primary or essential part of the malady. Peculiarity of constitution, too, whether natural or acquired, continually varies the aspect of the disease; and here to discriminate what is truly gouty from what is but casual is surely preferable to confounding the whole assemblage of symptoms by representing them as all characteristic of gout. The best mode of imparting just and clear ideas on the subject seems to be, to discuss first the disease in its simplest form; and having illustrated, so far as our knowledge permits, its nature and treatment, to extend inquiry to those complications which protracted malady or peculiarity of constitution occasions, instead of regarding these as distinct and peculiar varieties; in which course of investigation the several modifications distinguished as atonic, retrocedent, and misplaced gout, will be necessarily included.

Histories of gout have been rendered with a minuteness of detail highly creditable to those by whose patient observation and faithful delineation they have been supplied. So copious has been the record of symptoms, whether antecedent to, accompanying, or consequent on a paroxysm, that there is scarcely a derangement of the frame which has not at one time or other been noticed and included. It is full time to lay aside this tedious and profitless minuteness, — to classify those individual symptoms according to the functional derangements which they indicate, — to ascend from the manifestations to the causes which produce them, tracing to the disordered functions the several symptoms which denote their disturbance, — to look to the nature and character of such disturbances, and their connection with the disordered functions, as the only real source of useful knowledge, the only sure guide to rational or effectual practice in this or any other disease, — to distinguish what really belongs to the disease from mere contingencies, dependent not on the specific cause of gout, but on deviations from health local or constitutional which have no necessary connection with it, and which require to be treated precisely as if they occurred independently or in connection with any other malady. Divested of this source of confusion and obscurity, gout becomes as intelligible as are many diseases with which we consider ourselves better acquainted; and though after all our investigations the influencing cause of its peculiar and distinctive character is still a mystery, we may attain quite as intimate a knowledge of its pathology, as far as regards practical utility, as we possess of small-pox, rheumatism, or any other disease of the intimate nature of which we are ignorant, and which we are content to know only through the medium of the constitutional and local disturbances which mark their accession and progress.

In this view a paroxysm of gout can be regarded only as a constitutional disturbance of an inflammatory character, attended with local inflammation of a peculiar kind in one or more joints, running a determinate course, and in the earlier accessions terminating in health, for the most part within a very few days. Such being the character of simple gout, there is no reason why the complications so much dwelt on should be considered as specially belonging to it, or regarded otherwise than as accidents arising from peculiarity of constitution, contingent derangements of health, or the lesions or morbid tendencies entailed by preceding accessions.

That the paroxysm of gout manifests invariably an inflammatory character is a truth which all admit. The inflammation both local and constitutional occurs in every variety of degree; still an inflammatory character marks the whole. In consequence of the disease being identified with the local inflammation, and supposed to commence only when this appears, the seizure is generally represented as taking place suddenly, the previous good health being gratuitously assumed. This, however, is a great fallacy, no disease evincing so much constitutional disturbance or local inflammation, arising from a cause acknowledged to exist within the body itself, being ever of sudden occurrence. Ample warnings of the approach always exist, and would admit of ready detection, but that the parties, unsuspicious of what is pending or thinking lightly of the unhealthy deviations, overlook or disregard them; and as medical aid is not sought until the accession of the paroxysm, the premonitory indications are rarely submitted to the observation of the medical practitioner; whence a stage of the disease of the first importance, and that which is calculated to throw light on all the subsequent changes, has not received that scrutiny to which it is eminently entitled, nor been allowed the share which it ought to have, both in determining the true pathology of gout, and establishing the practice best suited to its relief.

In the active gout of robust habits, the plethoric state of constitution attendant has been too conspicuous to be overlooked, and accordingly it has received its full share of attention, although the indications of treatment which it presented have not always been acted on to the extent which they ought. It is of importance to understand that in cases where plethora is less obvious, its existence is not the less real nor the less entitled to the practitioner's serious attention. The subject of plethora, its intrinsic nature, modifications, and phenomena, is too extensive to be introduced in this place, a separate discussion being required to elucidate it, which will be found under its proper head. So connected, however, is plethora with gout, that a brief notice of its pathology becomes a necessary introduction to the further consideration of this disease.

The elements of nutrition being supplied to every part of the body by the blood, and this deriving its nutritive matter from the aliment taken, it is obvious that redundancy of nutritive matter may take place in the blood, either from sustenance being inordinately taken, or from a diminished expenditure of it in the ordinary appropriations. In either case the healthy proportions of the elements of which blood consists are altered, and a corresponding effect is produced on the several processes to which the blood is subservient. An accurate investigation of the actions and changes thus induced would go far to explain the origin and progress of many diseases. They should be traced, not by speculative conjectures of what might be ingeniously supposed to take place, but by carefully noting the phenomena which indicate them, and, by induction from well-ascertained facts, guided by a sound physiology, ascending to that point which connects the state of health with the morbid changes. These phenomena have been much overlooked or misconceived, and the semblance of debility which they present has been the source of much bad practice.

The plethora of a healthy and vigorous habit is familiar to all, is readily acknowledged, and seldom misunderstood. That which arises in habits more weakly by nature or depraved by vitiating influences, is less known, and its appropriate phenomena are more liable to mislead. When fulness of habit arising from redundant nutriment takes place in a healthy constitution, its earliest effects display what may be termed exuberance of health rather than a state of disease. The several functions of the body are more vigorously performed, the nutrition of its several structures is more abundant, and it acquires increase of bulk, especially if the habits of life are not of an activity capable of rendering the appropriation of blood in the several secretions commensurate with the nutriment inordinately supplied. Though this state cannot well be denominated disease, it yet approaches very nearly to the confines, as is continually exemplified in instances where acute diseases of formidable intensity assail persons considered as being antecedently in unusually good health. If the excess be casual or inconsiderable, the self-adjusting powers of the body are amply sufficient to dispose of it so as to prevent the accession of actual disease. And this is done simply by the stimulus of the too nutritive blood exciting the several secretories and excretories to an increased exercise of their several functions. But when, from extent or continuance, the excess is such as to urge these powers beyond a certain point, then these corrective energies fail, and irregular actions and distributions of blood take place, laying the foundation of a large proportion of the special diseases to which the human body is liable. The general character of the diseases thus induced is congestive or inflammatory; by depletion and abstinence the disturbing cause is corrected, and, thus relieved, the natural powers of the constitution soon re-establish a state of health. The more early such relief is afforded, the more prompt and effectual will it be, and the more certainly will those lesions and derangements be averted which protracted plethora is sure sooner or later to occasion. But to relieve it thus early so as to obtain these advantages, it is necessary to be able to recognise its existence by those evidences which denote it, antecedently to the stage of excitement known to us as fever or inflammation. These evidences present an equivocal character to those who have not closely observed the rise and progress of plethora, and they are continually misconceived as rather indicating a state of debility requiring support from nutriment and stimulants, than as calling for abstinence and depletion. When plethora (by which is understood not a mere redundancy in the quantity of the blood, but an excess in the proportion of the elements, chiefly the gluten, which supply nutritive matter to the several tissues) increases so as to exceed what the excited energies of the frame can healthfully dispose of, these energies, incapable of sustained over-exertion, become weakened, and a condition results which is very liable to be confounded with pure debility. The pulse becomes low, oppressed, irregular, and a state of general languor is experienced. Sooner or later this condition passes into one of permanently increased action of the blood-vessels, attended with additional phenomena, the assemblage of which constitutes that state to which we apply the terms fever and inflammation. For the full consideration of this subject we must refer to the article PLETHORA, as it would encumber too much the present essay. Some notice of it in this place was indispensable from its connexion with gout, and the necessity of referring to it both in elucidating the character and progress of the disease, and in establishing the principles on which the treatment should be conducted.

A paroxysm of gout is seen to consist of a peculiar constitutional disturbance terminating in a local inflammation, the occurrence of which latter, so far as the simple paroxysm is concerned, seems the natural remedy of the preceding disturbance. If the various derangements which usher in an attack of gout, instead of being promiscuously enumerated with a minuteness and to an extent which confound all clear conception, were classed according to the functions severally depraved, the representation would be much more simple and intelligible. All of them admit of being traced to lesions of the circulation, alimentary canal, the nervous system, and the several secretory and excretory organs. Pursuing the inquiry, it is not difficult to mark the connection of these with each other, or to detect the primary derangement in which they have their origin. Excess of nutritive matter in the blood, whether absolute or relative, has been seen to disturb the circulation, occasioning, first, a high activity of healthy function; secondly, an interval of diminished energy; and, lastly, a state of permanent excitement. By absolute excess is meant that which would be excessive in the most healthy state of the individual constitution, and which is always the result of inordinate nutrition; by relative, that which, though it might not exceed what a state of health with active exercise might safely endure, is yet relatively redundant when health has from any cause declined, or when from defect of wholesome exercise, the healthful appropriation has been more or less impeded. Under all these states of vascular action the several secretory and excretory functions become first excited and afterwards more or less depraved, and nervous affections of various kinds ensue, produced either by irritation of the splanchnic nerves, giving rise to endless sympathies, or by disturbance of the brain itself, occasioned either by too rapid circulation, or by remora of blood within it. The series of phenomena here noticed may be traced with considerable precision, and in the ordinary succession, although, so far as regards the nervous derangements, these admit of considerable variation. The best proof of the correctness of these views is to be found in the efficacy of the practice to which they lead.

It is this plethoric state of constitution that invariably leads to the accession of gout, and the premonitory signs of the approaching paroxysm may always be detected by those who seek them in the derangements of function which indicate a state of plethora. These could not have been so long considered as questionable were it not for the delusive appearance which some of the phenomena present, the suspicion of debility which they arouse, and the timidity of the class of patients most subject to gout, which, shrinking from all active treatment, and clinging to accustomed indulgences, has in all ages, even the present, biassed the judgments of practitioners; who, even when they see the right mode of treating gout, are unable to pursue it, and compelled to follow the established routine, however inert or mischievous, until from never witnessing the salutary effects of simple and direct treatment, they lose sight of its advantages, and at length cease to be conscious of any such being attainable.

A state of plethora, absolute or relative, precedes every accession of gout, and is the principal if not immediate cause of it. The intensity and duration of the paroxysm, too, are dependent on the degree of plethora prevailing, although other circumstances may contribute to prolong the attack. But, notwithstanding this, gout is not simply plethora leading to or ending in local inflammation. There is something more from which gout derives its distinctive character, and this ideal, at least unexplained, existence it is which constitutes the essence of gout. As we are utterly ignorant of it, save through the modifications of inflammation which it produces, our best and safest course, so long as this ignorance continues, is to pay no regard to it farther than to observe the phenomena which denote its existence; to mark their order and succession, with the deviations from the ordinary course of inflammation which they display; and to preserve our practical procedures free from any influences derived from mere speculations of this unknown cause, however ingenious, resting them solely on well-established facts and enlightened experience.

In simple gout we know of no good reason why the treatment applicable to the same degree of general fever and local inflammation occurring from other causes should not be employed. Its general safety and efficacy we can faithfully attest, nor are we aware of any peculiar caution being required beyond what the accompanying state of constitution and the attendant symptoms must necessarily suggest. In all diseases, however inflammatory, the state of constitution requires to be taken into account in judging the activity of practice that may be safely ventured on; and the same consideration is needed in gout, but assuredly none is due in this respect to the imputed essence of gout, nor to the apprehension of interfering with it which has been too long suffered to paralyze the efforts of the practitioner in contending with this hitherto unconquerable foe.

The constitutional disturbance which ushers in gout leads to a local inflammation, after the occurrence of which the constitutional derangements subside. As this inflammation in the earlier accessions quickly subsides, leaving the parts affected unimpaired, it is fair to consider it the crisis of the malady, and also its natural cure; though how it accomplishes this cure is a mystery which we are unable to solve. And were the disease to end here, the interference of art would be superfluous and improper; but it is far otherwise: renewed plethora leads to successive attacks; these progressively increase in intensity, duration, and extent of ravage; and woful experience amply proves that the mere efforts of nature, unaided by regimen, are quite incapable of extinguishing gout. Whenever gout occurs, therefore, it is always expedient so to assist nature as to accomplish more than her unaided efforts are capable of performing, both in rendering the attack milder and the recovery more perfect. The more speedily the constitutional disturbance is corrected, the less is the risk incurred of the gouty diathesis becoming confirmed, and the greater the security against the derivative ailments entailed by protracted or oft-renewed gout; the sooner the local inflammation is subdued, the less will be the ravages made in the structure of the inflamed joints, and consequently the less the liability to that decrepitude which rigidity of joints, whether arising from thickened ligaments, effusion into the bursæ, or the deposit of solid concretions, occasions.

The gouty paroxysm, involving as it does a state of constitutional plethora, attended with local inflammation, and a latent influence directing and modifying that inflammation, must always be contemplated in its compound character; but so far as practice is concerned, this must be regulated by reference to the inflammatory state, which is fully within our comprehension, rather than to the latent influence, of which we know nothing. The former, with sure and steady light, directs us safely on our way; the latter is much too indistinctly seen to afford us any guidance. If the first attack of gout were treated with due activity, as an accession so decidedly inflammatory would assuredly be were it not for the prejudices so long and so pertinaciously maintained, and if the diet and regimen were afterwards regulated as the tendencies of the constitution and the degree of the gouty diathesis would demand, the future ravages of the malady would be slight indeed, and its victims few. To disregard of the real nature of the malady, to timidity and inefficient treatment of it when it first occurs, and to the pernicious effects of ease and luxurious indulgence in the intervals, when active exercise and abstemious regimen afford the only means of counteracting the morbid tendencies that exist, may be traced all those horrid disorganizations and broken constitutions which have rendered gout the opprobrium of medical science.

As two elements concur in the formation of gout, the plethoric state and the unknown influence, it is clear that these may combine in every variety of proportion, and that the results will be conformable to the degree in which either may prevail. Where the gouty predisposition is strong, a slight degree of plethora will suffice to call it into activity: where the plethora is inordinate, a slight degree of gouty diathesis will give that direction and character to inflammatory action which will identify it with gout. In either case it is the plethora and inflammatory state which chiefly claim the practitioner's attention, and to which his remedies can be most beneficially directed,—with this difference, that in proportion as the diathesis, whether hereditary or acquired, is strongly marked, should the means corrective of plethora and inflammation be assiduously and perseveringly employed, within those limits which a sound discretion would enjoin. In the distinction, so much insisted on in the foregoing pages, between the constitutional condition and special influence which conjointly minister to gout, it is by no means designed to withdraw attention wholly from the latter, or to decry any inquiry by which a precise knowledge of it may be attained. The discovery, whenever made, must render essential service, and no opportunity of effecting it should be neglected. But until profound research or some fortunate accident shall disclose what has hitherto been hidden from our view, we must be content, if we would render our practice either consistent or effective, to follow that guidance which our familiar acquaintance with febrile and inflammatory affections so amply affords.

If the character of gout in its simplest form and highest intensity be unequivocally inflammatory, it is difficult to conceive why its various shades and modifications should be otherwise regarded. The differences are not greater than are continually met with in several other diseases; nor, when they do occur, is there any difficulty in referring the peculiarities to the particular constitution, the effects of previous disease, and other contingent circumstances amply sufficient to account for them. These circumstances may, and in numberless instances do require that the appropriate remedies of inflammation should be applied with caution; but they can by no means warrant the principles of treatment founded on the inflammatory nature of gout being wholly reversed, as is too often witnessed. There has been too much disposition, arising from timidity, ignorance, and false theory, to transfer to simple active gout the cautions and the apprehension of interference which contemplation of the complex and less active modifications has given rise to. The converse of this reasoning, if more generally adopted, would have led to happier results, to more prompt and effectual relief of gouty sufferers, and to a juster estimate of the practical benefits capable of being afforded by medical science.

Having thus prepared the way for a clear and intelligible discussion of gout, we shall proceed to treat the subject more methodically, and, so far as we are able, elucidate the circumstances which give rise to its various degrees and modifications, so as to enable the young practitioner to discriminate in the use of his remedies, and neither to withhold from gout the treatment which its prevailing character demands, nor to carry this beyond the point which sound experience warrants.

The paroxysm of gout has already been cursorily noticed. It is necessary to present it more fully, so as to mark distinctly the peculiarities which distinguish it from simple articular inflammation. Cullen defines regular gout as, "podagra cum inflammatione artuum satis vehementi, per aliquot dies perstante et paulatim cum tumore, pruritu et desquematione partis recedente." Accounts of the symptoms which precede and accompany the fit are rendered by all authors who have treated of the disease, to whose works we must refer those who wish to know all the morbid phenomena which may precede or attend the paroxysm. Sydenham, who, when he wrote his treatise on the gout, had been a personal sufferer from the malady for four-and-thirty years, has detailed those symptoms with a minuteness and accuracy that cannot be surpassed. He represents the attacks of gout as in general coming on suddenly, with scarcely any signs of its approach, except that the patient has been afflicted for some weeks before with bad digestion, crudities of stomach, and much flatulency and heaviness, which gradually increase until the fit begins; this, however, being preceded for a few days by a numbness of the thighs and a sort of descent of flatulencies through the fleshy parts thereof, along with con vulsive motions; and the day preceding the fit the appetite is sharp but preternatural. The patient goes to bed and sleeps naturally until about two in the morning, when he is awakened by a pain which usually seizes the great toe, but sometimes the heel, the calf of the leg, or the ankle. The pain resembles that of a dislocated bone, and is attended with a sensation as if water just warm were poured on the membranes of the affected part; and these symptoms are immediately succeeded by a chilliness, shivering, and slight fever. The chilliness and shivering abate as the pain increases, which is mild in the beginning, but grows gradually more violent every hour, and comes to its height towards evening, adapting itself to the numerous bones of the tarsus, the ligaments whereof it affects, sometimes resembling a tension or laceration of these ligaments, sometimes the gnawing of a dog, and sometimes a weight and coarctation or contraction of the membranes of the part affected, which become so exquisitely painful as not to endure the weight of the clothes, or the shaking of the room from a person's walking thereon; and hence the night is not only passed in pain, but likewise with a restless removal of the part affected from one place to another, and a continual change of posture. Nor does the perpetual restlessness of the body which always accompanies the fit, and especially in the beginning, fall short of the agitation and pain of the gouty limb. Hence numberless fruitless endeavours are used to ease the pain by continually changing the situation of the body and the part affected, which, notwithstanding, abates not until two or three in the morning, that is, till after twenty-four hours from the first approach of the fit, when the patient is suddenly relieved by a moderate digestion and some dissipation of the peccant matter, though he falsely judges the ease to proceed from the last position of the part affected; and being now in a breathing sweat, he falls asleep, and upon waking he finds the pain much abated, and the part affected to be then swelled; whereas before only a remarkable swelling of the veins thereof appeared, as is usual in all gouty fits. Such is Sydenham's description, which we have given in his own words as translated, being reluctant to weaken the force of such graphic delineation by any attempt at abridgment. The little admixture of theory evinced in the reference to digestion and peccant matter, cannot detract from the truth or value of this clear and circumstantial recital. For some days after this accession he represents that slighter degrees of pain and fever recur each evening, continuing until morning, after which all disease ceases, and the patient is restored to more vigorous health both of body and mind than he had antecedently experienced. This is the simplest course of a gouty paroxysm, and that which it usually runs on a first attack. On succeeding seizures, especially when the constitution is robust and plethoric, inflammation, on subsiding in one joint, becomes renewed in another, and eventually several joints are attacked in succession, and often two or more at the same time; so that in this progress every variety of intensity, extension, and duration becomes ultimately encountered. To dwell on these different degrees would be useless, as they are all but extensions and modifications of the simple paroxysm, requiring no modification of treatment beyond what the severity of the attack and the existing state of constitution enjoin.

The attack of gout is said to take place suddenly, and with scarcely any previous warning. Yet the very accounts which so represent it give abundance of premonitory indications, which are stated as preceding the attack even for some weeks. Dyspeptic derangements, with some nervous ailments, are the precursors usually noticed; and the assertion of good health existing up to the period of the gouty accession seems to have rested, not on any positive examination or knowledge of the fact, but on the mere circumstance of the patient not having his consciousness so aroused by any precise or considerable indisposition as to complain of being ill. So far as we have had opportunity of noticing the state of health which precedes the gouty seizure, we utterly disbelieve this assertion, and are satisfied that if the phenomena which mark incipient plethora and progressive febrile action were duly noticed, the same constitutional derangements which precede other inflammatory affections would be found uniformly to usher in gout. Disturbances of gastric and nervous functions are acknowledged; those of the circulation would be no less manifest if practitioners were more familiarly acquainted with the changes which the pulse undergoes in progressive plethora, from the stage of oppression marked by a pulse low and irregular both in force and frequency, to that of the permanently excited action of fever or inflammation evinced by a quick pulse, hot skin, and furred tongue.

One of the earliest instances of the introductory stage of gout which came under our observation occurred many years ago, and served to confirm impressions which our mind had for some years preceding been gradually receiving, from a careful observation not only of gout, but of all other inflammatory diseases. The case was detailed in some pathological and practical observations published in the Edinburgh Medical and Surgical Journal in 1814, from which we now extract it. It will show at least how much constitutional disturbance, perfectly obvious and unquestionable, may exist while the person affected is unconscious of being otherwise than in perfect health. "A gentleman about forty years old, and of full habit, had been subject to gout for several years. He arrived in this country in the course of last summer from America, where he had suffered several attacks of the disease. The treatment experienced under them I cannot specify, but in the intervals he was enjoined to take a pint of wine daily, in consequence of his gouty habit. This he acquiesced in from unwillingness to put his own judgment in competition with that of his physician, although he disliked the remedy, and thought himself always worse both from wine and full living. He called on me in autumn last, to know if he should drink the Bath waters, as recommended by his American physician, at the same time stating himself to be particularly well and free from complaint. I found his pulse full, strong, and nearly 100, and his tongue whiter than it ought to be. I consequently discountenanced any trial of Bath waters, and gave my opinion that he stood much more in need of bloodletting and evacuations. As he professed himself, however, to be so very well, I did not feel myself warranted in pressing this, though satisfied that his habit of body approached much too nearly to a state of inflammation. This conversation took place on Wednesday, the 14th of October; and on Thursday, the 15th, he was attacked with gout in the right knee. On Friday, a second attack took place in the left foot; and on Saturday, I was sent for. I found his skin hot, tongue white, and pulse 106, full and strong. Sixteen ounces of blood were drawn, after which the pulse fell to 84. A full dose of a purgative, consisting of colocynth, calomel, and antimonial powder, was given at bed-time, and a solution of Epsom salt the following morning. On Sunday he was better in every respect, but the pulse was again up to 96. It evinced clearly a necessity for further bloodletting; but as the purgative was then operating and the local disease abating, I was satisfied to order the bloodletting to be repeated the following morning. It was not in time, however, to avert a third attack, which took place during the night in the right elbow. Next morning I found the pulse as much reduced as if bloodletting had not been practised, although it did not take place in consequence of the state of the arm. Whether this effect was owing to relief to the general circulation being afforded by the formation of the local disease which had occurred during the night, or whether it proceeded from a degree of syncope and nausea which were experienced at first rising, or whether they were all dependent on some common cause, I shall not pretend to determine. At this time the knee was nearly well and the foot much better; and as the tendency to syncope had not entirely gone off, and he felt reluctant to have both arms incapacitated, he expressed a wish that the bloodletting might be deferred until the gouty arm got better. On Tuesday the foot was almost well, and the elbow getting better. The pulse, however, was again 96, full and oppressed, which determined me against incurring any further risk, and on having recourse once more to the lancet. About fourteen ounces of blood were taken, which induced some faintness. On Wednesday the pulse was 84, and there was no renewal of gout. Purgatives, salines, and low living were the only means employed thenceforward, and from this period he rapidly recovered. On the 26th he walked to my house, and could have done so some days earlier had the weather permitted. He expressed himself much gratified at the treatment he had undergone, as confirming the correctness of those views of the disease which he had always entertained, and declared to me that he had never thrown off such an attack so quickly, so perfectly, or with such unimpaired powers."

On the treatment pursued in this case we shall only remark, that had it occurred to us later in life, when our judgment was more matured, and our conviction of the safety and efficacy of active practice in gout confirmed by more ample experience, we should have hesitated less in affording the appropriate relief, and the result would have been still more favourable. The case, independently of the result, is of value on two accounts,—as exhibiting the unequivocal state of constitutional inflammation which precedes the gouty paroxysm, and as showing how far constitutional disturbance may prevail without the party having any consciousness of its existence. Were it not for the accidental examination made on the day preceding the attack, this person, on the evidence of his own consciousness, would have been pronounced in perfect health up to the period of the gouty accession. The inferences deducible from the facts here stated have been uniformly confirmed by all that we have seen of gout from that period to the present time.

Although gout, then, may arise without any evident external cause, a cause sufficiently manifest may be discovered in the attendant state of constitution by those who seek for it. It is true that where the gouty diathesis is strong, a slight degree of plethora may suffice to call it into activity, and in these instances the plethora and inflammatory tendency may, if not closely investigated or if only loosely observed, escape detection. Our firm persuasion, however, impressed by all that we have seen of the disease, is, that in every case of spontaneously occurring gout, more or less plethora either absolute or relative, and of inflammatory tendency sufficiently discernible, precedes the gouty accession; and that in proportion as this state is borne in mind, and the treatment regulated with reference to it, will the fit be more speedily and effectually relieved, the period of exemption prolonged, the ravages in the joints prevented, and the contingent maladies averted. From this view of the subject, it is clear that high feeding and indolence are very properly enumerated among the predisponent causes of gout. From these fulness of habit arises, and this, as will be more fully shown in the article Plethora, leads to a series of phenomena, which indicate first an overloaded and oppressed state of circulation, and afterwards one of increased action. When the latter attains its full activity, it constitutes what we call fever or inflammation, and any accident may determine the part which is to suffer most, and the function which is to be most depraved. When this plethoric and inflammatory state arises in a gouty habit, the result is an accession of the disease.

A remarkable peculiarity of gouty accession is, that the supervention of the local inflammation gives relief to the constitutional disturbance, and that, having effected this, it quickly and spontaneously subsides, at least in the earlier attacks, leaving the part so lately the seat of formidable derangement, somewhat weakened indeed, but otherwise in perfect health. The dyspeptic derangements connected with gout are no doubt traceable in a great degree to the luxurious living and consequent irritation of stomach habitual with those who chiefly suffer from this disease. But this is not their sole cause, for independently of the various excitements to which the stomach is subjected, the direct effect of plethora is to induce a congestive state of the capillaries of the mucous membrane of both stomach and intestines, and an increase of its appropriate secretions,—a condition which is the fruitful parent of gastric and intestinal maladies of various kinds. In the absolute plethora of robust habits, especially when the gastro-intestinal membrane is excited by full living and stimulants, this increased secretion of mucus in the stomach and intestines is considerable, and its production is readily accounted for. The efficient cause seems to be excitement of the secretory vessels by determination of blood to the capillaries, and by the blood possessing, from the redundancy of nutritive matter, more stimulant properties; the end,—increased appropriation of the nutritive matter of the blood, and consequent relief to the overloaded circulation from that redundancy which oppresses and disturbs it.

In the less vigorous and more temperate a correspondent state arises, when from diminished appropriation of blood, through sedentary life, inactive habits, or any other cause, the relative quantity of nutritive matter becomes greater than can be healthfully disposed of. And this serves to explain how a state of plethora and of febrile tendency so often occurs even in habits naturally spare; and where no obvious intemperance has been practised. Yet even in these the evidences of a plethoric state are readily discernible, and at an early period, if the phenomena which indicate it are rightly understood; and the effects, as displayed in the gastric and intestinal secretions, are in them even more signal than those which positive plethora usually displays, the morbid condition of the mucous membrane being generally of longer continuance and more confirmed ere attention is directed to it. These effects, though modified, are essentially the same in both, and require similar treatment; this differing in degree only according to the different powers of the constitution so affected, and being modified only by the state of the mucous membrane, and the greater or less time during which the congestion has been suffered to endure.

If the treatment, therefore, required for the more active and simple state of disease be once established, that of the lower gradations and more complex conditions will be sufficiently apparent, differing not in kind but degree, and combined with auxiliary remedies as incidental derangements may require. In weakly habits, and where the constitution has been suffered to struggle long under unrelieved plethora, these derangements are numerous and proteiform, harassing the patient and confounding the physician. So long as they are regarded as special maladies, and treated without direct reference to the state of constitution in which they originate, and by which they are upheld, the aid of medicine must be precarious and its success uncertain, conferring little benefit on the sufferer or credit on medical science. When assailed at their source by relieving the overloaded circulation, and restoring to more healthy action the several functions over which our remedies have direct and acknowledged powers, they readily give way, yielding oftentimes to the general improvement of the constitution without any special means whatever being needed for their relief. To the gastric and intestinal derangements, and to those which evince disturbance of nervous function, these observations more immediately apply. Digestion is impaired, and weakness of stomach is pronounced, for which cordials and tonics are deemed the appropriate remedies. Transient relief perhaps ensues in some improvement of sensation, some increase of appetite, and thus error becomes confirmed. But, unless evacuants be adequately and discriminately combined, such remedies ever do more harm than good. Administered alone and as the chief agents of cure, they tend directly to aggravate and perpetuate disease, repressing those efforts by which the overcharged vessels would, through increased secretions, unload themselves, and ultimately establishing organic lesions of different kinds. By continuance in their use, impression is made on the mucous membrane, diminishing its morbid secretions, and thus appearing to correct them, while the stimulants conjoined impart some feelings of renewed strength. Both effects, however, are eminently delusive. By suspending increased secretion, which, rightly understood, is the direct result of a congestive state of the capillaries, and the natural means of relieving them, disease is only transferred, not removed. It may for a time quit the capillaries, or rather its character in them is altered; but it is only to be driven back on the larger vessels, where it leads to deep-seated congestions and to disorganization of various kinds. If the constitution be still entire, it is pretty sure under such circumstances to become aroused sooner or later to some febrile or inflammatory effort, for which evacuations become indispensable, and thus relief to the oppressed and overloaded organs is at length afforded; if languid or much depraved by long continuance of the morbid condition, and still more if this condition have been aggravated by abuse of cordials and stimulants, and by the neglect of evacuations, then the constitutional efforts are feeble, they are disregarded or misunderstood, and a more assiduous use of wine and sustenance is urged for nurturing that strength which such means so applied never can restore. In like manner the various nervous maladies connected with this state of constitution run a similar course. Stimulants, antispasmodics, and narcotics, all lend their aid, but it is to palliate only, while in reality they do mischief. These maladies depend much on nervous sympathies arising from disordered stomach, but they are also in part owing to direct disturbance of the brain itself, through irregular circulation and morbid condition, chiefly of a congestive character, of its substance or investing membranes. Stimulants may, and oftentimes do, relieve this state for the moment, by rendering the cerebral circulation more active, and thus giving greater energy to nervous function; but the disease is not thus cured,—scarcely mitigated: the effect lasts no longer than the brief period during which the stimulus maintains its influence, and the state which ensues is still further removed from that of health. This can only be restored by so regulating the circulation that the mass of blood shall neither by its quantity or quality cause any extraordinary excitement of the vessels which convey it, nor need any increased efforts on their part for its disposal; and afterwards by rendering such assistance to the several secretory and excretory functions as shall re-establish them in the healthy and efficient exercise of their respective offices.

In judging of the instances in which tonic and stimulant regimen is supposed to be beneficial, and which are continually adduced in proof of its propriety, it is necessary not to decide hastily or absolutely from the immediate effects, but to watch such cases to their close, when the consequences will be sufficiently demonstrated. Many alleged cures are thus performed for which the parties have little cause to be grateful. Sooner or later formidable disease is sure to ensue, its form depending on the accidental excitements to which the body is subjected, and on the peculiar tendencies to which it is prone. In a gouty habit, reproduction of gout, and its confirmed establishment in its most aggravated shape, can hardly fail to be the result of such a regimen.

They who see much of what are termed chronic diseases must have ample opportunity of verifying by observation what is here stated. These cases present every species of internal congestion to which plethora, unrelieved by due evacuation and aggravated by stimulants, can give rise. Too often are the lesions of structure thus occasioned beyond the reach of art, while the exhaustion and attenuation are such as to preclude all attempts to relieve, save by temporising palliatives. How much of this kind of evil the constitution can bear, however, and how long an oppressed and overloaded circulation may endure without annihilating all hope of relief by rational treatment, is continually exemplified. Where there is no particular tendency to local or specific disease, and the effects of plethora and of febrile action are diffused over the whole frame, they may continue for months or years, still retaining all their original character, and still admitting of valuable relief from appropriate and duly active practice. Nay, even where a special disease is engendered, if it be one of slow progress and which does not immediately affect life, it may continue for years to cause extreme distress, and yet be capable of relief from rational treatment. The following case may illustrate these several positions. A delicate female had for ten years laboured under varied and extensive disease, which from all that we could learn had been throughout of the character which we have described. Being weakly, however, and exquisitely nervous, her complaints were referred to debility, and she was pampered and stimulated with tolerable assiduity. Symptoms of general dropsy were superadded to her other complaints, and were making rapid progress when she applied to us. The character of the disease was obvious enough; the remedies were equally so; but great caution was necessary in resorting to them, both from the extreme exhaustion, and from the constitution being extensively and miserably depraved. Yet was there no alternative, for without bloodletting effectual relief could not be afforded, and from the rapid progression of disease she must have speedily sunk. We drew blood in small quantity, which was thickly buffed and cupped; purged freely, and enforced low diet. The relief was prompt: the dropsical swellings subsided, nervous maladies declined, all her feelings were improved, and even strength was increased. Blood was afterwards taken repeatedly and more freely, and she ultimately became relieved from all her complaints so far as her broken health and the ravages sustained by long-continued disease would allow. For some years she has, in consequence of this relief, had much more enjoyment of life; and so satisfied is she of the remedy to which she is chiefly indebted, that she is herself the first to call for the lancet, when, as occasionally happens, recurring plethora or febrile action indicate its employment. This case, though not one of gout, serves to demonstrate the state of constitution which we wish to illustrate, and which is continually met with in connection with gout; such cases, whether gout be incidental or not, require that the healthy balance of circulation and of the circulating fluid be restored, as the first requisite; and that the several secretions and excretions be corrected and promoted according as their respective derangements demand. When this is done on the principles applicable to all diseases, then may the special nature of gout receive any peculiar consideration to which it may lay claim. But so long as a plethoric state of constitution exists, — a point on which no deceptive appearances should be suffered to mislead,—and the several secretions and excretions are depraved, must all special treatment of gout by imputed specifics be subordinate to those corrective measures by which the constitutional derangements are rectified, and general health restored.

As some have cavilled at the term constitutional as thus applied, and with a subtilty of criticism more ingenious than profitable, have denied that any such thing as constitutional disease can exist, inasmuch as every morbid action must affect some part of the system, I shall here remark that I employ the term constitutional in reference to the general condition of the frame, and the collective exercise of its several functions, the due balance of which constitutes a state of health. Derangement of these functions is more or less attendant on all diseases, yet it is not always considered as forming a part of them, and is in consequence too apt to be overlooked. The general health dependent on these functions we consider as having a claim to attention in every disease, even superior to that of the special malady; it is this state to which the term constitutional is applied, and we know not how it could be so well expressed by any other. In gout it is this which is entitled to our very first consideration, for not only is constitutional derangement attendant on every accession of gout, but some degree of it is essential to the formation of the paroxysm. In proportion as gouty diathesis prevails, will greater or less degrees of constitutional derangement arouse it into activity; but some previous disorder of the general health, some antecedent disturbance in the healthy balance of functions, is necessary to this end, for without such there would be no paroxysm. On a just conception of this truth all prophylaxis must depend.

After the foregoing discussion of the nature and character of gout, we might at once proceed to the curative treatment, were it not that this essay, which is to serve for an elementary as well as practical treatise, demands a detailed exposition of several circumstances which have not yet been noticed. For the sake both of perspicuity and brevity, we shall, in what remains, follow the order which methodic treatises on diseases usually observe.

Our general remarks on gout have been hitherto confined to those circumstances which more particularly indicate its character, and mark the morbid conditions which tend to produce it. Several others, however, require to be noticed; and here, as well as in the subsequent sections into which the subject will be divided, we shall occasionally borrow from what we have ourselves already published; and this not from indolence, but from the persuasion which we entertain, that where opinions are founded in truth, the original expression of them is more likely to be terse and correct than any repetition clothed in a different phraseology.

Dr. Cullen's definition represents gout as an hereditary disease. It is so generally, but by no means universally; and so far this character is improperly introduced into a definition. The general truth, however, of a predisposition to gout being entailed on offspring, is too well established to admit of dispute. Cases no doubt continually present themselves where no hereditary taint can be traced, manifesting that this is not essential. Dr. Scudamore, in some interesting tables, has shown that of a given number the greater portion acknowledged no hereditary claim to the disease. The fact of hereditary disposition, however, is not thus set aside, but has been too strikingly exemplified in numberless instances to be easily shaken. From the very slight influence which this point has either on pathology or practice, it is, in truth, of little real importance. The only consequence of admitting such predisposition seems to be, that when it is supposed to exist, gout may be expected to take place under circumstances which, independently of this tendency, would not have power to originate it; and that hence a salutary caution may be suggested to those who have any consciousness of hereditary claim, to guard with particular care against the various causes which excite gouty action. While false theory prevailed, and the establishment of gout in the extremities was considered essentially desirable as relieving the constitution from peccant humours supposed to be thrown on the affected joint; and when the suspicion of a gouty diathesis led to a free use of stimulants as a means of repelling the enemy from vital parts; when the supposition of hereditary taint was not harmless, the regimen enjoined tending directly to arouse what might have lain dormant, if not to create what might otherwise never have existed. But if rational principles of gout, its nature and treatment, were generally established, the admission of its being hereditary could lead to nothing but good, and might effect such changes as would in time cause the evidences of hereditary disposition wholly to disappear. Indeed it would be well if the fact of hereditary transmission were more generally received and more deeply impressed, as many who would prefer the liability to gout to any sacrifice of luxurious indulgences, so long as they regarded the choice as affecting their own persons alone, might exercise some self-restraint if assured of the consequences which their excesses might entail on their offspring and descendants.

Though the paroxysm of gout usually occurs in the way described, and without any evident external cause, yet any accident or injury of a joint occurring in a gouty subject, may, instead of simple inflammation, bring on a fit of gout, or rather the local inflammation excited may assume all the characteristics of that disease.

The precedence of gastric derangement is not necessary to constitute gout, many being unconscious of any such up to the accession of the local inflammation. In advanced cases, however, and in broken constitutions, this premonitory indication is rarely absent.

Pyrexia so generally attends that it may well be considered a characteristic feature. In those cases where, from languid or enfeebled powers, it is less obvious, and where to superficial observation it might appear not to exist, more careful investigation of symptoms would rarely fail to detect it.

Women, though not exempt from gout, are less subject to it than men. Dr. Gregory used to state the proportion as one to fifty in England, one to one hundred in Scotland. For this relative immunity in females they seem indebted to their greater temperance, and also to the facilities which the female constitution possesses of throwing off redundancies by natural outlets. Dr. Gregory had observed among his patients, that the women who suffered from gout had antecedently been subject to profuse hemorrhages, such persons being generally plethoric through indolence, sedentary lives, and high feeding, and hence predisposed.

Vigorous and robust constitutions are most subject to gout, though no spareness of habit affords security against it. The cholero-sanguine temperament is said to be that which is most liable.

Gout is most generally a disease of middle and advanced life. Its attacks usually occur from the age of thirty-five onwards. When the predisposition is strong, however, it may commence much earlier. Dr. Gregory met with it oftentimes among his pupils, young men from 18 to 22, and who had not earned it by intemperance.

The relief to the general health imputed to the supervention of the paroxysm, though an observation partially founded on truth, becomes progressively less speedy and less signal as the disease advances. It has ever been too much relied on, and has led to much pernicious practice, both medicinal and dietetic.

So many causes, both remote and immediate, have been assigned to gout, that they require to be noticed; for though most of them are merely contingent and accessory, they all merit attention where regard to the juvantia and lædentia is so important.

Hereditary disposition has been sufficiently discussed, as have also the influences of plethora and of the unascertained cause from which gout derives its distinctive character. Whatever induces a state of plethora may become a cause of gout, whence luxurious living, indolence, and sedentary habits, have ever been the chief means of exciting or producing it. By these is the gouty predisposition urged on to active disease; and, so far as our knowledge extends, they are fully capable of originally producing it. The extremes of luxury, or of indolence, however, are not required to produce this effect. Lesser degrees may induce plethora sufficient to destroy the balance of health, and thus beget disease. A slight redundancy of nutritive matter in the blood, whether arising from excessive supply or diminished expenditure, may create an inflammatory state, which, in a habit predisposed, may lead to gout, even where the habits of living may appear temperate, and where moderate exercise is taken. No terms are more loose in their general application than temperance and exercise. Credit is continually claimed for the former, where the animal food and wine habitually taken far exceed what nature requires or can bear; and the name of exercise is oftentimes given to bodily exertions so gentle that they lead to no increased expenditure of blood, while, by increasing appetite, they too often tend to augment and enrich it. Gout is a disease of the rich and indolent, not of the poor and laborious; and this truth, so obvious and incontrovertible, ought to have had more influence on medical opinions than it has been allowed to exercise. If there were no other fact whatever ascertained, this alone might suffice to point the way to the efficient prevention and treatment of gout. In Scotland there is an old saying worthy of being held in remembrance, that any man may free himself from gout by working for and living on sixpence a-day.

Next to plethora, whatever causes induce debility of stomach have been regarded as principally influential in bringing on gout. The observation is to a certain extent true; yet the facts on which it rests have been egregiously misconceived, and much pernicious practice has in consequence resulted. Weakness of stomach being assumed, tonic and invigorating regimen was of course considered as indicated, and long and pertinaciously has its use been persisted in, notwithstanding the utter failure of such treatment to mitigate, much less subdue the disease. Had the nature of this assumed debility of stomach been more closely investigated, it would have been seen to present a character very different from what tonic or stimulant remedies could essentially relieve. It might, at least in the earlier stages, have been clearly traced back consecutively to inordinate and depraved secretions, turgid condition of the mucous membrane, congestion of the capillaries, and general plethora, all readily relievable at the commencement by evacuations and abstinence, all aggravated by nutritive diet, stimulants, and tonics. All reference, therefore, to debility of stomach as a cause of gout should extend, not merely to the alleged weakness, but to the several causes, both coincident and consecutive, by which the important function of digestion becomes weakened or disturbed.

Various causes are instrumental in exciting the paroxysm, but they are all subordinate to those mentioned, and incapable of such effect unless where depravation of health has prepared the way. Excess of venery is an acknowledged exciting cause, as is also abuse of spirituous liquors, as well as indigestion, whether occasioned by the quantity or quality of the food taken. To the immediate effects of this last cause may be referred many cases of imputed gout in the stomach, which have been wholly independent of gout. Dr. Gregory used to relate a case where he was called to a patient said to have been seized with gout in the stomach; but he found his complaint caused, not by gout in the stomach, but by pork in the stomach, of which difficultly digestible food he had too liberally partaken. By getting rid of it he was perfectly relieved, and there was nothing more heard of gout for that time.

[A recent writer, (Dr. W. Budd, in Tweedie's *Library of Medicine*, 2d Amer. edit. iii. 587, Philad. 1842,) is disposed to think — and the observation of the writer leads him to the same belief — that malt liquors tend, even more than wine, to produce a gouty diathesis, and the evidence, which he adduces on this subject, is striking (see vol. i. p. 179).]

Intense study has brought on gout. It is stated by Sydenham that one of his most severe attacks was occasioned by immoderate application in writing his essays on the disease, and that gout returned as often as he attempted to go on with the work.

Purging has been said to bring on the paroxysm, and such a coincidence no doubt occurs; but it would be a great error to suffer this observation to deter from a judicious use of purgative remedies.

Continued costiveness is a more probable cause, yet this can only be regarded as an incidental derangement, depraving, so long as it continues, several other functions, and adding to the disorder of the general health.

Change from activity to indolence has been often noticed as leading to gout, a circumstance readily understood. Change from low living to high is equally intelligible. But sudden change of the opposite kind has been marked by the same effects, as was signally exemplified in the patients of the celebrated Dr. Cheyne. He, as all know, was the advocate of temperance, and having enjoined it to his gouty patients rather too absolutely, and without sufficient discrimination, he had the mortification to find that his directions, so far from obviating the attack, hastened the paroxysm, which afforded great exultation to the opponents of his doctrines. Their triumph, however, was far from complete, although it served for a while to confirm existing prejudices.

The hypothesis of gout being caused by a special morbific matter, eliminated and expelled by means of the paroxysm, has been fully and ably refuted by Dr. Cullen. There is no proof whatever of any such existing; and assuredly it is not, as was long imagined, identical with the concretions deposited in gouty joints.

Cold, heat, external injury, depressing passions, too great exercise, especially in walking, have all been enumerated among the causes capable of exciting gout; but they can only be regarded as mere accidents, having no power to induce the disease, save when the habit is on the very verge of the paroxysm.

The diagnosis of gout must be derived from its history and general character, for there is no pathognomonic symptom whatever to distinguish it from rheumatism, the only disease with which it is liable to be confounded. Each disease, perfectly formed, is sufficiently distinct from the other; but the intermediate degrees approach each other so nearly, that to discriminate with absolute certainty would require a more intimate acquaintance with the essence of both diseases than we can take credit for possessing. All that can be done here, then, is to note the peculiarities of each, and then to leave it to the practitioner's own judgment and observation to decide to which any equivocal case may belong.

Gout is generally a disease of advanced life, not occurring for the most part till thirty-five; rheumatism most frequently attacks the young, that is, from the age of eighteen to thirty. Yet the converse of this is so often true, that the observation furnishes no ground of accurate diagnosis; rheumatism attacking every age, while, as has been shown, not even childhood is exempt from gout. Gout in its earlier attacks fixes on one joint, extending not beyond; rheumatism, even on its first seizure, most generally involves several. Gout, while simple and incipient, runs a definite course, the local inflammation spontaneously and completely subsiding in a few days; rheumatism has less tendency to spontaneous decline, and, unless arrested by prompt and active treatment, usually continues much longer. The subsidence, however, of local inflammation in rheumatism under active treatment resembles very closely the natural abatement of gout. In gout the constitutional disturbance sensibly abates on the supervention of the local inflammation; this does not appear to be the case in rheumatism, where, on the contrary, the articular inflammation is often attended with increase of fever. In gout the part inflamed is red, tense, shining in a high degree; in rheumatism it is less so in all these respects. Desquamation of the cuticle has been regarded as a criterion of gout; but the cuticle is oftentimes detached in rheumatism much more extensively than ever occurs in gout. We have seen the cuticle so completely separated from the hand and wrist in rheumatism as to admit of being drawn off like a glove. In gout the pain is exquisite, even when the part affected is at perfect rest; in rheumatism it is much more moderate when the part is at rest, though most acute on the slightest motion. Gout is more apt to be preceded by gastric derangement than rheumatism. After all that can be said on the subject of diagnosis, much uncertainty must still attach to many instances, while there are modifications which partake so much of both, that it would be impossible to assign them with certainty to either; and accordingly we find the term rheumatic gout, though not recognised by nosologists, in familiar use among the vulgar, and not scorned even by practitioners. Are we yet prepared to decide to which the very peculiar disease known among medical men as as nodosity of the joints belongs? It is usually classed with rheumatism, yet there are quite as many grounds for allying it to the gout. After all, the distinction is of little real importance, for if the pathology of gout, which we believe to be true, be established, the treatment of the individual case will not be very different to whichever genus of disease it may be assigned.

The prognosis of gout must depend on so many circumstances, that it would be impossible to affirm it positively or with any precision. Simple gout occurring for the first time runs a determinate course, ending generally in health, and cannot therefore be regarded as a disease of much danger; on the contrary, it has, by a strange delusion, been customary to hail its presence as conservative of health and a guarantee for longevity! However the supervention of the paroxysm may occasionally obviate greater evils, we should greatly doubt the desirableness of its occurrence, and must leave it to gouty sufferers to appreciate both the value of the remedy and the enjoyment of the years so prolonged. In advanced gout the state of constitution, the ravages already sustained, the organs incidentally affected, and even the principles on which the treatment of the particular case is conducted, must be taken into account ere any conception either of the probable duration or event can be formed.

It has been customary to represent gout as incurable, and for ages it has been pronounced the opprobrium of medical science. Ere proceeding to discuss the treatment, it may be worth while to consider how far this reproach has been justly attached. Whether there be or not a cure for gout, is a question of which the answer must depend on the sense in which the term cure is used. It is a common error to contemplate diseases as if each, instead of consisting of an aggregate of functional disturbances, were itself something individual and specific, — some element superadded to the frame producing a specific derangement of health, and capable of being corrected or neutralized by its proper remedy, as a poison by its antidote. Thus the doctrine of specifics has ever prevailed, and it continues to hold its ground even at the present day. It has even been imagined that as mercury is an imputed specific for syphilis, cinchona bark for intermittent fever, there must for every disease exist in nature some peculiar and appropriate remedy which it is the business of physicians to discover. No disease has been more signally subjected to this misconception than gout, and the search for a specific capable of extinguishing it has been often and anxiously renewed. To those who thus judge of diseases and their treatment, it may be confidently replied that there is in medicine no cure for gout, for no remedy capable of realising such expectation ever has been discovered, or ever can be. To such delusion gouty sufferers are peculiarly inclined, for, habituated for the most part to luxurious indulgences, and reluctant to forego them, they lend a willing ear to every vain boast which affects to cure them without a sacrifice of their sensual enjoyments. The consequences of this error have been doubly injurious, not only by diverting attention from that investigation of the disease which could alone explore its real nature and devise its proper treatment, but also, where any remedy of peculiar efficacy was happily discovered, by causing such indiscriminate application as to render it in the end more injurious than serviceable, and at length to destroy the reputation to which it might justly lay claim. But if gout be regarded as it really is, an assemblage of functional derangements, traceable respectively to intelligible causes, and, when rightly understood, admitting of correction by suitable agency, then, though there be a superadded cause in the essential principle of gout, of the precise and intimate nature of which we are still ignorant, the disease may be pronounced curable in the same sense in which we apply the term to other maladies, provided practitioners, instead of vainly seeking for specifics, pursue the course of treatment which true medical science enjoins, and patients be content to follow that regimen by which alone the end can ever be attained. By medicine alone we can do little to obviate the predisposition which leads to gout; but by suitable regimen duly and inflexibly persevered in, we may render it harmless, so that even in cases of high susceptibility, where, notwithstanding our best care, paroxysms may occasionally recur, these will be slight, and productive of but little evil. But even this liability, if manifested in the earlier periods, should be regarded as owing to some imperfection in the use of preventive means; for if these be fully and judiciously employed, the renewal of paroxysms may, as long as the general constitution is still uninjured, be wholly and effectually prevented.

This assertion, as now expressed, is of course limited to those cases where gout on its first accession is subjected to proper discipline both remedial and prophylactic; for where the predisposition is strengthened by repeated accessions of the disease, and disorganizations have taken place in the joints, or any of the viscera have, through the effects of gout, become depraved, the hopes of complete success must be proportionally weakened. In this sense, then, it may be boldly averred that gout is not an incurable disease. We can cure the paroxysm, and can restore the patient to perfect health, which it is in his own power afterwards to preserve; and if he, in defiance of right counsel, renews the disease by continuing the luxurious and indolent habits which foster it, the reproach should lie, not on medical science, the precepts of which he disregards, but on his own weakness and wilful perseverance in injurious practices. Other diseases as well as gout, nay all, are liable to recur on the predisposing and exciting causes becoming renewed; yet they are not thence considered incurable, nor are they deemed a reproach to medical science merely because medicine alone cannot secure against relapse. There is no reason why relapse of gout should not be equally referred to a renewal of the causes which lead to it, and as the principal of these are obvious and capable both of prevention and correction, the incurableness of gout should not be alleged so long as the means of cure are neglected or inadequately employed, nor should medical science be reproached when its clearest dictates are discredited, and its most urgent remonstrances unheeded and despised.

The most important treatment of gout is the preventive; for if this, however successfully the paroxysm may be relieved, be not assiduously pursued, disease will recur, and acquiring force by repetition, will eventually inflict all its wonted penalties. The principles, too, of the preventive treatment are the same which should govern the practice through all stages and conditions of the disease, modified only by contingent circumstances, but never superseded nor reversed; on which account a full discussion should be given in the first instance to the prophylaxis of gout.

If the views exhibited in the foregoing pages be not wholly fallacious, the establishment of a rational and efficient prophylaxis of gout can be neither difficult nor doubtful. It has been seen that to constitute gout two circumstances must concur,—a predisposition to this form of disease, and a loss of balance in the constitution through excess of nutritive matter, creating what is termed plethora, and arousing the predisposition into active disease. It would be useless to dwell on, or affect accuracy in deciding which of these conditions is the more active, which the more passive,—which should be called the predisposing cause, which the exciting. The main point to consider is, that their concurrence is essential; for if there be no tendency to gout, plethora may induce any other form of local inflammation or fever, but will not give rise to gout: if there be no plethora, even a strong hereditary disposition may lie dormant, and the elements of gout, of whatever nature they be, will not show themselves by the formation of a paroxysm. Of these causes one is utterly unknown to us, and consequently we are unprovided with any positive or direct means of acting on it; but the other is completely under our control, and however great the tendency to it in any instance, we have ample power when it does arise to remove it by means of depletion and abstinence, and to prevent its recurrence so as with certainty to keep within the bounds of health by temperance and exercise. To these few and simple instruments of prevention may be referred all the procedures required for prophylaxis; all further discussion of which must consist of pointing out the degree in which they may be severally required, and the modifications necessary in applying them so as to attain the end desired without hazarding other evils, to obviate redundancy of nutrition without withholding adequate sustenance; to repress hypersthenic orgasm without inducing asthenic debility; and, in averting an inflammatory disease, not to beget others of an opposite character, but to preserve the constitution in that due exercise of all its functions which perfect health implies and requires.

Though the instances may not be many of gout being eradicated or kept quiescent by means of regimen, inasmuch as gouty subjects have been at all times singularly averse to pursuing such discipline, yet have they been quite sufficient to establish the fact of the capability; and it should be borne in mind that by no other means has the end ever been attained. The late Dr. James Gregory of Edinburgh was a signal instance of the perfect success of the regimen which he ably advocated and strenuously enforced. With a strong hereditary predisposition, gout having existed in his family for generations, and his father having been an early victim of it, he was himself seized with the disease at a very early age; but subduing it by abstemious living, he was disposed to congratulate himself on having obtained exemption. The effects, however, of slight indulgence during a casual visit to Oxford, admonished him that he could take no liberties; and from that period he abided steadily by the regimen which he had laid down for himself, the safety and efficacy of which he had proved, and by adhering to which he was never afterwards visited with gout. This account of himself he used to deliver annually to his class; and when the writer of this article heard him do so in the sessions of 1802 and of 1803, he had reached his fiftieth year without experiencing a return.

In instancing his own case, Dr. Gregory's object was not so much to adduce proof of the efficacy of preventive regimen, as to show that the very spare living and bodily labour which some had inculcated, and which deterred many from attempting to pursue a rational course, were by no means requisite; but that a very moderate degree of both would, if persevered in with steadiness, fully suffice. He was accustomed to appeal, in proof of this, to his own person, the robust form and fresh complexion of which gave ample assurance of its being sufficiently nourished, and to conclude his remarks with saying, "You will allow, gentlemen, that I am no starveling."

The consideration of preventive regimen may be conveniently subdivided under two heads,—the prevention of plethora, and its removal whenever its appropriate phenomena denote its presence. For the first, it would be impossible to lay down any express rule of diet that would be suitable for all habits and constitutions; and to this head all the doctrines advanced in the article PLETHORA apply. Where there is a predisposition to gout, with a tendency to fulness of habit, great care should be taken not to minister to fulness by too much or too nutritive diet. Animal food should be sparingly taken, and fermented liquors should be cautiously avoided. The quantity of food necessary for full health and strength is very moderate, especially where bodily exertion is inconsiderable; and the majority of mankind consume habitually far more than is good for them; whence arises a large portion of their diseases. The doctrine is unpalatable, and the physician who enforces it will hardly be a favourite with the many; but it is not the less sound; and so long as mankind persist in closing their eyes to the truth, they must suffer the consequences of their wilful blindness. When the time arrives, as come it must, that a knowledge of the animal economy shall form a part of liberal education, and each individual shall be capable of comprehending the structure and functions of his own frame, such truths will be more readily acknowledged, and physicians will have fewer obstacles to contend with in the conscientious discharge of their duties. The temperance necessary for lessening the tendency to gout has been often and ably enforced; yet, judging from the ravages daily witnessed, and from the accounts of early treatment and of regimen pursued which such sufferers report, but little progress has yet been made in establishing generally sound principles of management for gouty subjects. Nutrition is still encouraged as a means of supporting strength, wine is enjoined to keep gout from the stomach, and excesses of every kind are committed; while credit is taken for moderation merely because they are not carried to extreme, nor as far as inclination might prompt. Whatever is taken beyond what the wants of nature demand is excess; and numbers are guilty of it who are unconscious of being so. In a healthy frame the natural energies are ever active in appropriating and throwing off the redundancies, and in this way apparent health may be long preserved; but if the excess be continued, disease is sure sooner or later to result, when medical discipline, now indispensable, carries off, by one outlet or other, what the constitution can no longer endure. It is the part of wisdom to avoid this issue by maintaining habitual temperance, the practice of which will ever ensure a rich reward.

Dr. Cullen has judiciously laid down as indications of treatment in gout, to moderate the paroxysm, and to prevent its recurrence. The practice of many gouty sufferers seems exactly the reverse, namely, to hasten the paroxysm and to increase its violence, under the false impression that a severe attack eliminates and expels from the system more gouty matter than a weak one. The doctrine claims to be founded on fact and experience, yet is it eminently untrue. The fact that the accession of gouty inflammation brings relief to pre-existing constitutional derangement belongs only to the earlier seizures, and does not hold true generally of gout; and the belief of the paroxysm purifying the constitution of gouty matter in proportion to its violence, resulted entirely from a false hypothesis respecting the materies morbi of gout, and though supported by the high authority of Sydenham, is utterly untenable. There can be no doubt at the present day, that the indications of Cullen are those which ought to be followed.

Next in importance to regulating the ingesta, is preserving a state of free and adequate excretion. However moderate the diet, if through neglect of exercise or other causes nutritive matter be imperfectly appropriated, and excretions become defective, a loss of balance must result; the blood must become charged with both nutrient and excrementitious matter in excessive proportion, decline of health ensue, febrile excitement become aroused; and in a gouty habit, such progressive depravation will be pretty sure to end either in a paroxysm, or in an abortive effort of the constitution to form one. These are the cases which have involved the subject of gout in so much obscurity, and by their equivocal character have led to the abuse of stimulant treatment. It is obvious that the state of constitution here referred to may be relieved in two ways, apparently opposite; either by exciting the constitutional powers to increased efforts for appropriating and expelling the redundant matter, or by diminishing this so as to keep it within the ordinary powers of nutrient action and excretion. On a fair comparison and just estimate of the relative value of the two modes, there can be little room for hesitation in giving a decided preference to the latter. Far better is it to prevent plethora by temperance in diet, and to promote appropriation and excretion by exercise, than to keep the energies of the frame overstrained by continued use of stimulants. The superiority would be great were we to regard only the general ill effects of continued excitement, which not only exhausts power, but creates a necessity for the stimulus to be progressively increased; it becomes far more so when we take into account the destructive lesions of important organs, to which stimulation of overcharged vessels almost necessarily gives rise. If plethora be obviated by temperance and exercise, or removed by depletion and abstinence, the several organs and functions of the frame are left in their natural and healthy state, in which the natural powers, unaided by stimulants or tonics, are fully capable of preserving them. But when it is attempted to remedy plethoric ills by increasing the energies which nature exerts for their removal, the several functions, even when successful in effecting temporary amendment, become exhausted and debilitated, their ordinary efficiency is impaired, congestions ensue, leading to local inflammation and organic lesions; and a host of maladies severe and untractable are the eventual result. By rational prophylaxis all such consequences may be effectually and certainly prevented, while daily observation too clearly shows how little they gain who combat such ills by stimulants and tonics. So long as temperance is observed, the several functions of health will be so performed as to need little assistance from art. Still, as no casual care may suffice to give full security against casual derangements, attention should be given to the several excretions, the most important of which are those of the bowels and the skin. The bowels should be kept free, and the skin perspirable; mild aperients will serve the former purpose, active exercise the latter.

After temperance in diet, and adequate excretions, the next agency available for obviating plethora by promoting the appropriation and final expulsion of what is taken into the system is exercise, which in the prophylaxis of gout is of the highest importance. However complete and undeviating the temperance which a person threatened with gout, and anxious to avert it, may observe, the aid of active exercise will still be necessary to give the security which he seeks, and which his case admits of. Indolence in him may beget evils directly analogous to those which repletion produces, and, though modified by circumstances, leading to similar results. Whatever the sustenance taken, it requires to be expended in all of its several appropriations; and the effete matter which it continually displaces needs to be discharged from the system by active and adequate excretion. If nutritive appropriation fail in healthful energy in any of the tissues of the frame; if, through defective excretion, the effete matter continually passing through the appropriate outlets be not fully thrown off, both nutritive and excrementitious matter must accumulate in the blood in undue proportion, and induce a condition of the body generative of disease. To promote both purposes, adequate exercise is the natural agent, the use of which cannot be superseded by any medicines however valuable or however lauded. Bloodletting may remove redundant nutritive matter from the circulation; purgatives, diaphoretics, and other evacuants may succeed in rendering the excretions more active and efficient; but no sound mind, judging even by common sense, much less if at all aware of the relative effects of preventive and remedial courses of procedure, can hesitate which to prefer. It is much better not to overfill than to be obliged to empty; it is far more healthful to prevent accumulations of excrementitious matter through active exercise, for which the body is so admirably constituted by nature, than to remove them by any evacuants, however certain in their operation. The two simple terms, then, temperance and exercise, convey whatever is essential in the prophylaxis of gout; and, if rightly understood so as to be strictly practised, they would be amply sufficient for all useful guidance. Further discussion could only regard the degree to which each should be carried so as to ensure its good effects without hazarding contingent evil. To pursue the subject minutely in this place would swell this article beyond its allotted extent. They who comprehend the doctrines advanced, and imbibe their spirit, will be at no loss so to regulate regimen as to produce nothing but good. It may be remarked that extremes in either respect are quite unnecessary; and the evidence of Dr. Gregory's personal experience has sufficiently shown that gout may be thus effectually prevented without extraordinary macilency, or any privations incompatible with rational enjoyment of life.

But notwithstanding all the care which the most cautious can take, irregularities of diet, interrupted exercise, and other inevitable deviations from the prescribed course, will induce occasional plethora leading to derangement of health. The evidences of this, and the means of abating it, become then the next subject of consideration. When fulness of habit begins to appear, the diet, however moderate, should be still further abridged; animal food should be more sparingly taken, fermented liquors discontinued, the bowels kept more free, and the exercise rendered more effective; and these attentions would be expedient even while the increasing fulness presented no evidences but those of health. Should they suffice, nothing more will be needed. But if plethora advance so as not to be thus removed, if consciousness of health becomes disturbed by morbid feelings, and these be accompanied by a labouring circulation; if, finally, a hot skin, quick pulse, and white tongue, denote the stage of febrile action to have commenced, then, though no local congestion or inflammation should yet have occurred, blood should be taken, purgatives employed, and the whole regimen should be strictly antiphlogistic. It may be deemed that at this incipient stage bloodletting may be dispensed with, and certainly it is not the general practice so to employ it; but this we attribute to practitioners not being sufficiently aware of the real state of constitution, nor of the great advantages derivable from early bleeding. It is true that this stage is not immediately dangerous; that it may be suffered to advance somewhat without much hazard, it being the consecutive derangements rather than the incipient plethora or febrile action which beget danger; that it may even get well, and without ulterior mischief, although bloodletting be not practised. But these admissions will not alter the question either of the real nature and tendencies of plethora, or of the remedies which most safely, promptly, and effectually relieve it. Of these remedies the most direct, and unquestionably the most eligible, is bloodletting. It removes the cause of disease more effectually than any other remedy; it more promptly restores to the several functions the healthful energies of which plethora with its consequences deprives them; it supersedes the protracted use of other evacuants; and by quickly suspending the exhausting effects of continued febrile action, it virtually preserves strength instead of wasting it. For this purpose large or repeated bleedings are never needed. A single venesection to twelve ounces, with purging and low diet, will oftentimes suffice to arrest progressive disease, and re-establish the sanative efficiency of the natural powers. And here, again, early bloodletting saves even blood, if this were an object, (and it is an object that it should never be unnecessarily nor superfluously taken;) for moderate bleeding early employed will avert severity of disease, which, where it does ensue, often demands profuse depletion to save life, and thus consigns to tedious convalescence, if the party be fortunate enough to escape a more fatal result. It might be beneficially laid down as an axiom, that, abstractedly, bloodletting is the direct remedy of febrile action, its use and modifications being determined by circumstances. In idiopathic fevers produced by miasmata, and attended with prostration of power, its employment may be questionable, and great caution at least is required in applying it; yet when early and judiciously employed, it has proved a powerful agent in arresting the progress and mitigating the symptoms even of typhus, as the records of medicine abundantly prove. In such cases much requires to be taken into account, which the skilful practitioner will not overlook; and especially the character and tendencies of the prevailing epidemic should be allowed their full influence on his judgment. In febrile action of an ordinary character the same caution is not necessary; and here the solicitude should be not to escape bloodletting, but to discover sufficient evidences of a labouring and disturbed circulation to encourage the having recourse to it; for when timely used, the duration of disease is materially shortened, the necessity of medical discipline considerably diminished, while the constitution is spared the ravages which protracted fever, even when ultimately cured, too often entails. With these remarks on the means of preventing plethora in a healthy subject, and of remedying it when it does occur, we may now dismiss the prophylaxis of gout.

From all that has been stated in the foregoing pages of the nature and character of gout, it is obvious that antiphlogistic treatment is that which is essentially required for its cure; and were it not for the complications produced by false theories, improper regimen, and the perverted use of remedies, the establishment of this truth might almost suffice for all practical guidance. When the prophylaxis of gout shall be more clearly understood, and more generally practised, these complications will decline, and simple treatment will alone be needed. But until that happy day shall arrive, it must be necessary to specify the various practice required, so as to mark its adaptation to the several varieties of constitution, stages of disease, and morbid complications, which are sure to present themselves for a long time to come. On the practical instructions which follow we wish to observe, that, however they may seem to flow from the principles laid down, they have not resulted from merely speculative views, but are supported by the best experience of the profession, as handed down by distinguished writers for ages, and are established to our own firm conviction by all that we have ever seen of the disease or its treatment.

A first attack of gout affords, of course, no opportunity for prophylactic treatment. It comes on, if not unannounced, at least unexpectedly, the party being first warned of it by the actual seizure. The treatment of the paroxysm, therefore, in its simplest state, becomes the first subject of practical illustration. There can be no doubt that the more this is treated on general principles, and the less the special nature of the disease is heeded, the more prompt and effectual will be the relief given, and the more perfect the correction of that morbid condition of the system in which the attack has its origin. If there be a full habit, with active fever, as marked by a full and frequent pulse, hot skin, and white or loaded tongue, then bloodletting, purging, and antiphlogistic treatment, should be employed as freely as if the fever and local inflammation passed under any other name. In mild attacks and where constitutional disturbance is less strongly marked, such active treatment may, perhaps, be waived, and the tendency to spontaneous subsidence already noticed, be trusted to without immediate ill-consequence resulting, especially if, after this admonition, a prophylactic regimen be steadily pursued. Still, however mild the attack, except it take place in a broken constitution, or under circumstances decidedly adverse to direct depletion, we would deem it wise practice to take some blood, so as to render more complete the purposes for which nature institutes the paroxysm. Of this treatment of a first paroxysm we certainly cannot adduce cases; but as in more advanced gout we have bled freely, both on the approach of the paroxysm, at its height, and on its decline, regarding only the state of constitution, and not the special malady, and this not only with perfect safety, but with eminent advantage, we feel fully justified in applying to a first attack of gout the principles which we would not hesitate to follow at later periods, and under circumstances less favourable to their full and beneficial operation. It has been seen that the simple paroxysm runs a definite course, terminating in a few days in renewed health. And if the gouty effort be slight, and the existing plethora inconsiderable, this alleged restoration of health may be so complete as to need no interference from medicine. But if there be much plethora, then the fever aroused may not subside on the gouty nisus having effected its purpose of establishing a local inflammation. The pulse may remain high, the skin hot, the tongue loaded, with the various other depravations usually attendant on a febrile state. Under these circumstances no question can arise on the propriety of effecting by art what nature fails to accomplish. Bleeding, purging, cooling salines, with antimony, and low diet, should all be employed in proportion to the acuteness of the symptoms, and the constitutional energies displayed. But whatever hesitation there might be in interfering with a first paroxysm, on the ground of its not being needed, and of nature being equal to accomplishing her purpose, there can be none, when the disease recurs in a constitution otherwise healthy and vigorous, in resorting to the same constitutional treatment which would be applicable in any other active inflammation. The plethora and inflammatory action are abundantly demonstrated by the attendant symptoms, there being a full, strong, bounding pulse, with hot skin, white tongue, and all the concomitants of active fever. The local inflammation, so far from militating against the employment of active practice, affords additional reason for promptly resorting to it; for if not speedily allayed by suitable depletion, severe pain is unnecessarily prolonged, disorganization is hazarded, and greater debility of parts ensues, with more impeded motion of joints, and more tedious convalescence. On the accession, therefore, of the paroxysm in an otherwise healthy subject, if no earlier opportunity be afforded, a full bloodletting should be employed, and the bowels should be freely purged with a competent dose of calomel and colocynth, followed by a saline cathartic. If these means succeed in making impression on the system so as to reduce the pulse nearly to the healthy standard, the general fever may be treated by saline antimonials and aperients, like any other febrile excitement. Should the pulse again rise in frequency, force or hardness, with renewed heat of skin and whiteness of tongue, the bleeding and purging would require to be repeated. The only distinction which we know between such an attack and any of the simple phlegmasiæ, regards the topical applications; for so long as the local inflammation is removable by constitutional treatment, topical remedies should not be employed, unless demanded by an urgency of suffering, such as, when constitutional treatment is properly employed, will very rarely occur. The local inflammation has a natural tendency to subside, as has been stated; and it is perfectly justifiable to await this, at least for the usual period, without resorting to topical remedies. When it lingers, the fault lies not in the joint, but in the constitutional state, which keeps up the inflammation, and to this state are remedies best directed.

There is a distinction, both in the febrile state and local inflammation, that deserves to be noticed. Both to a certain extent belong to the paroxysm, constituting it and subsiding with it; but both may continue beyond the time when the paroxysm, running its natural course, would spontaneously subside; and this is dependent, not on the gouty nisus, but on the constitutional condition. Relieving this condition by depletion and febrifuge regimen will subdue disease in both respects. If the local inflammation, however, have been suffered to establish itself, it may keep its ground even after the plethora and febrile action have been sufficiently abated; and here it is that local treatment may be needed for expediting and completing the relief of the inflamed joints, and averting these structural lesions which protracted inflammation is sure to occasion. To abstract blood locally before the general circulation is sufficiently unloaded, gives no effectual relief; for if the constitutional state be not corrected, the local inflammation, however it may be allayed by topical bleeding or cooling applications, is pretty sure to recur, while some risk is incurred of the inflammation being transferred to some other joint, if not to some vital organ. Leeches, therefore, though their use is sanctioned by high authority, should assuredly not be employed in the ordinary treatment of the paroxysm, nor until the continuance of local inflammation after the removal of the constitutional disturbance manifests that the local disease has acquired an independent existence. In this state leeches and other local remedies may be safely and beneficially applied, but antecedently to it their use is not appropriate. If leeches be unsuited for what may be strictly regarded as the paroxysm, repellent applications are still more so; and though in slight cases they may appear to succeed, their use as a general remedy for gout is eminently hazardous. If the constitutional treatment be conducted as it ought, they will be rarely needed; and far better is it that the local inflammation should yield to the constitutional correction, than that it should subside under local remedies. In the one case its decline affords evidence that radical relief is obtained, an assurance which must be incomplete when topical treatment is trusted to, however successful it may in any particular instance prove. That the final cause of a gouty paroxysm is the relief of the system, and that it accomplishes this to a certain extent, are truths sufficiently established; and if the relief were complete, the interference of art would be superfluous and improper. But there is strong reason for believing that the paroxysm does not sufficiently relieve the surcharged system; and hence the assistance of art becomes necessary for seconding the operations of nature. But this assistance requires to be directed to the constitutional state rather than to the local ailment. So much is effected by the gouty effort, whatever its intimate nature may be, that it would be unwise to interfere with it otherwise than by removing the necessity which incites it. This may always be safely done by abating plethora and restoring general health; but until this precaution be taken, it cannot be expedient nor always safe to arrest suddenly the local malady by local bloodletting or repellent applications. As subsidiary to the constitutional treatment, there can be no objection, in highly nervous temperaments, and where inordinate sensibility prevails, to soothe by cold or tepid sponging, or by any equally harmless adjuvant; but as was before remarked, if the constitutional treatment be adequately employed, such remedies as these will be little needed. In treating the paroxysm of gout, the indications are to relieve the constitution, and to moderate the local inflammation, so as to prevent the disorganization to which its violence or continuance would give rise. Both are best fulfilled by the constitutional treatment already directed. The converse of this practice, or that which, disregarding the constitutional derangement, directs its efforts to subduing the local inflammation by any means capable of producing such effect, has been at times confidently advised, and was revived with high commendations some years ago, but no treatment can be more hazardous nor more at variance with sound pathology. By promptly relieving the paroxysm through means of constitutional treatment, suffering is abridged, danger averted, convalescence accelerated and rendered more perfect, the recurrence of disease obviated so as to be thoroughly capable of prevention by prophylactic regimen, and at least rendered more distant; and the gouty diathesis, which the long continuance and repetition of paroxysms invariably strengthen, is weakened and suspended. Were incipient gout always treated on these principles, and the premonitory signs which give notice of its recurrence detected in sufficient time to employ the depletion and abstinence necessary for averting the paroxysm; and were prophylactic treatment afterwards pursued to the extent and with the steadiness necessary for ensuring its effects, the victims of reiterated gout would be few, and the disease would soon cease to be the opprobrium medicorum which it has been so long considered.

It must be borne in mind that the foregoing remarks and practical instructions apply to gout as occurring in its simplest form, and in a constitution otherwise healthy and of unimpaired vigour. When it arises in a habit naturally feeble, vitiated by other diseases, or injured by repeated accessions of gout itself, the treatment, though similar in principle, must yet be greatly modified; and on the accuracy with which the necessary measures of relief are adapted to the existing powers, and suited to the concomitant derangements of function or structure, will the ultimate success depend. The perfect health of each and every function should be the standard by which all deviations should be judged; and the endeavour should be to restore severally, and by the treatment appropriate to each, whatever may appear disordered. Far preferable is this simple and intelligible proceeding to regarding any symptom as characteristic of gout and applying to it some supposed specific, without reference to the direct operation of the remedy, or the physiological changes which its administration effects. Abiding by such a standard, which has the advantage at least of being real and definite, and ceasing to connect both symptoms and remedial effects immediately with that conjectural and indefinite entity, a nosological disease, practitioners would in all diseases see their way more clearly, and proceed more directly and effectually to their object. Such mode of observing disease, too, would render the misconceptions and discrepancies of practical writers harmless, and enable the practitioner to unravel any complication of symptoms however intricate. As diseases are too much regarded in their complex and individualized character, so is it too much the habit to view the operation of remedies in connection with the more remote curative effects, rather than with their more direct influence on physical functions. The former mode leaves out of view much that requires to be intimately known, and may well be characterized as empirical; the latter alone can lead to just and accurate conceptions of morbid actions and remedial agencies; and in proportion as it takes a lead in guiding the practitioner's treatment, is his practice entitled to be considered rational and scientific.

Some correct views on this subject have lately been presented by Dr. Spillan of Dublin, in a small volume entitled "A Supplement to the Pharmacopœia." Even where remedies evince what is deemed a specific operation in the cure of certain diseases, their effects can be very generally resolved into their primary and direct influence on certain functions of the frame, and their curative agency be thus satisfactorily accounted for. This, at least, should be attempted in all cases of alleged specifics, although, however minute and accurate the investigation, something will ever remain undisclosed in the properties of each drug, to give it its peculiar character, and distinguish it from others of the class to which it belongs. Rhubarb, jalap, aloes, colocynth, are all purgatives, and with a view to their purgative effect are they principally employed; yet practitioners discover grounds of choice which lead to selection and preference independently of their relative strength as purgatives. When they are administered, however, it is the purgative operation that is sought for, and through this operation the curative effect is expected. It should be so with all remedies so far as our knowledge of their direct agency admits. To this agency we should more particularly direct our attention, at the same time that we avail ourselves of every advantage which unexplained properties may afford in combating diseases. A specific for gout has always been considered a desideratum, and mankind have ever been deluded by the vain hope that one would be discovered. Absurd as is the search pursued with this view, it has conferred one advantage at least, by making us familiar with a medicine which, though not entitled to be called a specific, is yet highly valuable, not only in gout but in almost all inflammatory diseases. The medicine to which we allude is colchicum, and from a tolerably extensive employment of it for several years, we can faithfully add our testimony to the several records which attest its virtues and utility. When we were first induced to make trial of it, we took some pains to ascertain by close observation its real powers, and the best mode of administering it; and as our subsequent experience has made no change in the conclusions at which we then arrived, we cannot do better than transcribe here the account which we rendered of it in a small volume published in 1822. "A full dose of this medicine purges copiously, allays pain, and lowers the pulse. These effects are produced with greater certainty if the fulness of circulation be previously reduced by bloodletting, and the mucous secretions of the intestines evacuated. When inflammation is high, as marked by a strong bounding pulse, hot skin, and loaded tongue, bloodletting should always precede the use of colchicum. But in cases where arterial action is more moderate, and direct depletion from any cause questionable, this medicine may be resorted to with peculiar propriety and eminent advantage. Its operation seems to combine the several advantages of bleeding, purging, and sedatives, and is therefore particularly adapted to those cases where active depletion is inexpedient. In treating hereafter of the several modifications of gout, in so many of which venesection must be sparingly employed, or wholly withheld, I shall have occasion to recommend the free employment of this valuable remedy. And as the forms in which this medicine is given, and the modes of administering it are of much importance, I shall fully explain my own practice in both respects, without presuming, however, to limit the application to those methods which I have been led to prefer. Various preparations and different modes of exhibition may, in the hands of other practitioners, be quite as salutary as those which I employ; for as I observed on a former occasion, the effect, not the form, of prescription deserves regard. The preparations which I have tried are the vinous tincture of the root, the vinous and spirituous tinctures of the seeds, and the powdered seeds. Of these I decidedly prefer the tinctures of the seeds, as being more uniform in strength, and more certain in operation. It might be reasonably expected, from the virtues of colchicum being found to reside in the seeds as well as in the root, that the former would yield a medicine of greater uniformity, being in a state of more perfect and determinate maturity, requiring less care in the collection and preservation, and being less liable to have their powers impaired. My experience of the several preparations fully confirms this supposition.

"It has been already remarked that colchicum purges, abates pain, and lowers the pulse. Its sedative powers, though sensibly connected with its evacuant, are not, however, wholly dependent on them. The motions produced are copious, frequent, and watery, and the operation seems more analogous to that of the saline purgatives than of any other cathartic. The number of motions is sometimes considerable, without any proportionate depression of strength ensuing. I have known even twenty stools occasioned by a dose of colchicum, the patient not complaining of the least debility.

"These circumstances will guide our employment of this medicine as a remedy for gout. Where the plethora is considerable, undoubtedly bloodletting should precede its use, for colchicum seems to remove the more fluid parts of the blood only: and these being quickly renewed, the relief obtained by this medicine alone cannot be so perfect or permanent as when bloodletting is also employed. Though the sedative powers of colchicum are valuable assistants to bloodletting in abating arterial action, they are yet no perfect substitute for this remedy in cases of high inflammation; neither are its evacuant qualities capable of superseding those cathartics which expel mucous secretions. In cases, then, of active gout occurring in a full habit, we would invariably bleed, and purge with calomel and antimony before having recourse to colchicum. It is possible that colchicum might occasionally diminish pain and abate inflammation more speedily if administered earlier; but it should never be forgotten that in the treatment of this and all other diseases the important object is not to allay pain or combat symptoms, but to restore general health with the least possible injury to the functions or structure of particular parts. In this respect the physician's province seems analogous to that of the Roman dictators, who were appointed, not to combat an enemy nor quell an insurrection, but to take care that the commonwealth received no injury. In like manner the physician should provide not for the relief of a mere transient or other incidental ailment, but should so conduct the disease to its termination that no permanent injury be inflicted on the constitution. Unhappily, far from being left to the uncontrolled exercise of his judgment in accomplishing this end, he is too often compelled by prejudice and caprice to adapt his practical treatment, not to the real nature of the disease, but to the preconceived notions, impatience, and ignorance of those by whom he is surrounded. When colchicum is to be employed, it may be given either in full doses so as to purge actively, or in divided doses frequently repeated. A drachm, drachm and a half or two drachms, of the tincture of the seeds should be administered at night, and repeated, if necessary, next morning. This quantity will generally purge briskly, but if it fail, a third dose the following night will be pretty sure to succeed; at least I have seldom found it necessary to exceed these doses. The full operation being thus obtained, I usually continue its use in smaller doses, ordering twenty minims three times a day in any of the common saline mixtures. Even this dose will occasionally purge so actively as in a short time to require its discontinuance, in which case the antimonial salines should be given without it, so long as febrile symptoms render necessary."

Such were the views which careful observation of the properties and medicinal effects of colchicum led me to form ten years ago, and it is somewhat in proof of their accuracy that a tolerably extensive use of the remedy in the intervening period has induced no change in them, while it has increased our confidence in the efficacy and utility of the remedy when used as an auxiliary to more active and direct treatment. What might be regarded as its specific powers seem resolvable into those more simple and direct influences which it exerts on the animal frame. It purges, allays pain, and lowers the pulse. These effects are accounted for by assigning to it a cathartic and sedative operation, and it is this combination perhaps to which its peculiar virtues are to be ascribed. The reduction of pulse might appear a result of its purgative operations, but it can, without purging, lower the pulse. That it possesses sedative properties is abundantly shown by its effect in allaying pain, and this where no purging is occasioned; and, so far as we have been able to observe, we should consider the reduction of pulse as produced by its sedative rather than its evacuant properties. We are also disposed to regard the sedative properties as those from which it derives its chief value. These discussions are important, as they assist in reconciling the discordant testimonies which are still offered on the subject, and when finally closed, will establish that discriminating use of the remedy which will ensure its fullest advantages.

It has been alleged, repeatedly and on highly respectable authority, that colchicum does no good unless it purges. This we disbelieve, because our own experience contradicts the fact, and because it is inconsistent with what we have witnessed of the other properties possessed by colchicum. On the principle of a purgative effect being required, several practitioners combine the remedy with purgatives, and with advantages well calculated to confirm the propriety of so doing. This mode we repeatedly tried in our early use of the medicine, but saw no inducement to pursue it. On the contrary, if we had a difficulty in exhibiting colchicum, it arose from its too great readiness to purge, and the consequent necessity of relinquishing it. When we need its availing powers in allaying the inflammation of gout, rheumatism, or any other disease, we are always best pleased when it does not speedily purge. In other words, we look for benefit more to its sedative than its evacuant operation; the latter can be supplied by other and better means; in the former it possesses advantages peculiarly its own. The explanation of these different opinions is not difficult: it must be sought in the views of those who administer the remedy, and the practice which they conjoin with it. If it be used as a specific, and without previous bloodletting, then we can readily understand that unless it purge it will be of little avail; but if the pulse be lowered by adequate bloodletting, and the bowels cleansed by calomel and colocynth, we would then say that a purgative effect from the colchicum itself is not needed, nor at all essential to its beneficial operation. For the active gout of vigorous habits we would not give colchicum in full doses; or with a view to purge, but we would bleed and purge as in the ordinary treatment of the phlegmasiæ, and then conjoin colchicum in small doses with the ordinary febrifuge salines. Even when given in this way it will oftentimes purge actively, and, as we consider, to a disadvantage; for when it begins to excite the bowels, it must be at once relinquished, the continued irritation becoming intolerable, and, as we suspect, not very safe, although, having ever been cautious, we have never witnessed an instance of mischief thus occasioned. The views here presented we would wish to be scrutinized, for if correct, they would lead to a use of the remedy more precise and direct than yet obtains, and encourage practitioners to profit by its aid even when no sensible effect is immediately produced by it.

And here we cannot resist offering a remark which appears to merit attention. In former times, the Materia Medica was encumbered with a mass of frivolous and inert medicine, and thence rendered so unwieldy that some retrenchment became indispensable. The more worthless were cut off with no sparing hand, and it may be doubted whether some were not thus expunged from the list which might have been beneficially retained. However this be, there sprung from this kind of investigation a scepticism respecting the virtues of all medicines which did not evince a direct and determinate influence on some function or other of the frame. The same feeling carried into practice demanded that each dose of a medicine should produce a sensible effect, and from this tendency it is that we think error has sprung. Although in active and urgent disease, requiring prompt relief, we would employ the full and adequate agency of remedies, yet in a large portion of medical practice, and especially where long-established or habitual morbid actions are to be corrected, we are persuaded that more good results from their more gradual and oftentimes imperceptible operation. When morbid actions have continued for a certain time, and still more where structural changes have commenced, the organs and tissues concerned are not capable of sudden change, nor can they by any activity of treatment be brought back immediately to a healthy condition. As the morbid change is gradual, so also must be the corrective process, whether instituted by nature or promoted by art. In effecting it nature is ever slow and deliberate, and in this respect art would oftentimes do well to follow her example. When it is once ascertained that a medicine does possess active properties, it should not be suspected that these should be evinced by every dose of the remedy administered, nor should it be concluded that the remedy is inert merely from the absence of immediately sensible effect. This consideration would be to us a sufficient reason for placing a certain confidence in small doses of colchicum, even if we looked only to its specific or curative effects. When we regard the simpler properties into which these effects are resolvable, we are still more confirmed in the propriety of not withholding such doses on the mere ground of their not acting on the bowels.

Many remedies are continually administered from confidence in their accustomed properties, without an immediate or directly sensible effect being expected. Antimony is conjoined with salines to render them more febrifuge, and the effect is expected to result from its primary operation on the stomach: yet the evidence of nausea is not always insisted on, nor is it inferred, from the absence of nausea, that the antimony is useless. When the primary operation of colchicum comes to be better understood, it will be given in imperceptibly operating doses, with as much confidence as is now felt in the exhibition of antimony.

[For the different forms in which colchicum is administered in gout, see the author's *New Remedies*, 4th edit. p. 179; or his *Practice of Medicine*, 2d edit. ii. 607.]

By the treatment prescribed in the foregoing pages the paroxysm of gout may be promptly and effectually relieved, the constitution re-established, the powers of the affected limb preserved, and the gouty disposition diminished. A due attention to prophylaxis may afterwards prevent its ever recurring. The value of such practice is most conspicuously displayed when contrasted with the negative treatment so generally resorted to, by which the paroxysm is greatly prolonged, the constitution very imperfectly relieved, the structure of the joints sooner or later utterly disorganized, and the gouty diathesis confirmed and rendered inveterate. If gout were always of an active character, and confined to constitutions naturally vigorous, it is highly probable that the medical treatment would never have been perverted so egregiously as it has been. But this disorder occurs under every condition of health, and in all degrees of animal power, from the highest vigour to that helpless debility which can scarcely generate a paroxysm. Cases of this latter description will not bear active discipline; if employed, the patient must sink rapidly under it; and the danger arising from such maltreatment has no doubt been often the means of exciting an alarm well calculated to make a deep impression on those who are more peculiarly liable to this disease.

The too frequent error, too, of prescribing for the name of a disease rather than its peculiar condition, may have oftentimes caused extensive injury to result from ill-judged activity of practice, and thus have contributed to bring this method of treating gout into disrepute. Be the causes what they may that have so often occasioned active practice in gout to be resorted to by practitioners and again abandoned, it must be evident that, if this disease in its simplest form and highest intensity is so essentially benefited by the measures here prescribed, a modification of the same practice must, upon every principle of sound reasoning, be applicable to all inferior degrees of the same malady. From this conclusion not even the most timid need take alarm, for as the circumstances of each case sufficiently indicate what evacuations may be safely employed, no rational practitioner can ever be tempted by the doctrines here maintained to carry them beyond the point of safe and salutary endurance. Indeed there are many strong inducements to keep far within it; and provided the principles of treatment be not compromised from vain apprehension or too great pliancy of disposition, we should not be anxious in a great number of cases for the practice to be carried to the utmost limit of even safe and salutary employment; for as medical aid must necessarily be administered by men of various capacities and acquirements, all of whom may not be equally qualified for adapting accurately, in the details of practice, what principles enjoin, it will be the safer course to fall short somewhat of that activity which would most effectually relieve, rather than run any risk of exceeding it. These prudential considerations will have their full weight with every practitioner however enlightened. The more intelligent and experienced will of course feel more confidence in their own powers of accurate discrimination, and will pursue proper means with greater energy and less hesitation. All, however, must yield occasionally to prejudices long established, and to fears which the sensitiveness of friends cannot always relinquish or control. But the practitioner will give way to such impediments with greater safety to his patients and more satisfaction to his own feelings, by keeping steadily in view the principles here inculcated, and regulating his practice in modified obedience to their clear and forcible dictates.

Before dismissing the consideration of the simple and active paroxysm, a few points more are to be noticed. It has been remarked that in the local inflammation two stages may be occasionally distinguished, one being primary, the product of the paroxysm, running a determinate course and spontaneously subsiding; the other secondary, dependent more on the general inflammatory diathesis than on the gouty nisus, and tending not to spontaneous decline, but to disorganizations destructive of the mobility of the joints, and leading to eventual decrepitude.

Under the natural course of the paroxysm, and especially when the violence of this is subdued by suitable constitutional treatment, the first or purely gouty inflammation needs no local applications. The secondary requires direct and suitably active treatment for its removal. Leeches, cold or tepid lotions, and eventually blisters, may all be necessary. On this head it may suffice to remark that the safety and efficacy of such local treatment must ever be proportionate to the relief antecedently given to the general constitution. If the constitutional derangement be corrected, the gouty nisus will not recur; and the secondary inflammation may be subjected to ordinary and appropriate treatment without hazard of metastasis either to other joints or to vital organs.

So soon as decline of inflammation, whether primary or secondary, permits, early return to moderate exercise is of the first importance. It becomes then the best agent in restoring free circulation to the several weakened tissues, in obviating morbid depositions, and promoting the absorption of whatever may have taken place; thus preventing the thickening of ligaments, rigidity, and the contractions so apt to ensue, and enabling the party speedily to enter on the more active exercise which prophylaxis enjoins. And the precept is the more to be relied on, as it applies equally to other articular inflammations from whatever cause they arise, whether rheumatism, accident, or any other. Provided the cavity of the joint be not involved, (and in a large proportion of cases the inflammation is wholly exterior to it,) protracted rest is injurious, and the source of much mischief. Under it parts become rigid, of which early return to exercise would preserve the flexibility; depositions take place, producing permanent thickening of ligaments, or loading the bursæ of the tendons with glairy mucus, in either case impeding motion. The muscles, too, consigned thus to inactivity, in time waste and become enfeebled, and eventually complete decrepitude with broken health ensues. From what has been said respecting the prophylaxis of gout, it must be evident how sedulously every source of impeded motion should be avoided by gouty patients whose joints have yet escaped disorganization. Such patients have themselves remarked that, when compelled by circumstances to use their limbs early after a paroxysm, they have recovered with less impaired powers than when they have been enabled to indulge in rest. The principle is unquestionable, and no sensibility to slight pain, nor any vague apprehension of renewing the paroxysm, should be suffered to prevent the early renewal of moderate exercise, so necessary for promptly restoring the mobility of the joints, and preserving to the individual the power of still further re-establishing his health through their instrumentality. The attenuated limbs of gouty and rheumatic subjects are more owing to suspended exercise than to any effect of the special maladies. So convinced are we on this point, that we would in our own person infinitely prefer hazarding a renewed paroxysm either of gout or rheumatism, to encountering the manifold evils which protracted rest is sure to occasion.

Only one source of constitutional derangement has been hitherto noticed in this essay as connected with gout, namely, that which arises from excess of nutritive matter in the blood. Another no less important requires now to be discussed, as materially concerned in the several modifications of gout which are yet to be considered. It is the vitiation of blood which arises from the excrementitious matter continually carried back to it by the absorbents, not being adequately excreted and expelled. Health requires that the nutritive matter taken into the system should be duly appropriated to all the structures which compose the body; it also requires that the effete matter, which, having done its duty, is displaced by the nutritive particles deposited, and which in the ordinary course of animal functions is carried back into the blood, should through the admirable agency provided by nature, be from thence regularly and adequately discharged. If nutritive matter be taken in excess, it either increases the bulk of the body beyond the bounds of full activity and vigour, or, producing excitement tending to its own appropriation or removal, but also if too long continued generative of disease, it begets a state of fever or inflammation more or less active. On the contrary, if the excrementitious matter be not adequately expelled, it accumulates in the blood, vitiates its quality, and depraves the nutrient and other secretions, thus impairing, by a slow and insidious process, health and strength, and laying the foundation of a direful class of chronic maladies. Temperance in diet is the only safeguard against the former, but it is a certain one; exercise is also necessary for obviating nutritive plethora, by promoting the healthful appropriation of the nutriment taken, while it is the chief means of keeping in due activity the several excretory processes by which the effete matter of the system is eliminated and expelled. Of excrementitious redundancy only a brief account can be rendered in this place, the fuller discussion being more appropriately given in conjunction with Plethora, with which it is so continually intermixed.

As excess of diet gives rise to nutritive plethora, and as deficiency of exercise both contributes to the same end by retarding the appropriation of the nutriment supplied, and promotes further vitiation of the blood by loading it with excrementitious particles, it is obvious that the two states of redundant nutritive matter and accumulated excrementitious particles may co-exist in every conceivable proportion. As each in its simplest state is characterised by its appropriate phenomena, the several combinations admit of being detected by enlightened and diligent scrutiny; and to this end would inquiry be far more profitably directed than to searching after specific agency in drugs for correcting evils which, having their origin in a primary depravation of the source of all nutrition, can never be radically cured but by means corrective and preventive of the primary mischief which occasions them. These pathological views point out the high importance of temperance and exercise as means both of preserving health and correcting disease. So far, at least, as the former purpose is concerned, all theories will concur in this recommendation, which is too firmly founded on common sense to be shaken by any speculation, while the advance of true pathology will maintain the equal importance of bearing the principle in mind in combating diseases.

From not being provided with a better term, we have on former occasions designated the accumulations of excrementitious matter in the blood as excrementitious plethora; and though we like not the name, we must continue to employ it. We do so with less reluctance from the necessity which exists for considering both nutritive and excrementitious plethora in conjunction, their various intermixtures being such that it would be impossible wholly to sever the discussion of them. Some future day, when the pathology of the blood shall receive the attention which is pre-eminently due to it, better terms than either can be readily substituted.

Gout being a disease no less of indolence than of repletion, it is manifest that its subjects are among those whose blood is vitiated by retained excrementitious matter as well as by redundancy of nutriment; and this consideration explains why mere abstinence, unassisted by active exercise, can never be expected to eradicate gout. Though the diet be temperate, yet indolence begetting general languor of frame, and this languor being confirmed and perpetuated by the effects of excessive excrementitious matter, causes a languid and imperfect appropriation of whatever sustenance is taken; a degree of nutritive plethora thus relatively ensues, and the elements of acute disease are thus supplied. To distinguish both states and their multiplied combinations, it becomes necessary to display their separate conditions, and by contrasting them with each other, to furnish indications by which the prevalence of either, or the intermixture of both, may at any time be detected.

The phenomena of nutritive plethora, its increase, and final transition into a febrile state, have already been sufficiently described. Excrementitious redundancy in the blood begets a very different condition, but one no less marked by its appropriate indications. These are a sallow aspect and dusky skin, the pulse low, soft, and easily compressible, the surface of the body for the most part harsh, dry, and obviously deficient in natural transpiration, the tongue moist, clean, red; the appetite capricious, often craving, with an endless train of dyspeptic ailments; the alvine discharges inveterately foul, dark, slimy, pitch-like, and exhibiting no traces of healthy fæces; the urine high-coloured, often fetid, and depositing more or less of sediment: these several evidences, or a certain portion of them, with decline of flesh and strength, are sufficiently characteristic of this state. The condition itself we believe to arise from imperfect elimination of excrementitious matter; and the depraved state of the several excretions we regard as resulting from the laboured though inadequate efforts of the constitution to accomplish its own purification. How much this state is combined with the more advanced and complicated conditions of gout will be readily perceived; and it is by bearing in mind this source of vitiation, as well as that furnished by nutritive plethora, that the treatment will be most judiciously and successfully conducted. The direct effect of excrementitious plethora is unhealthiness of nutrient secretion, producing feebleness of the organs thus imperfectly nourished, and progressive decline of strength. The efforts of the constitution to throw off this oppressive load fail of success, and their ineffectual renewal, as well as the progressive unhealthiness of nutrient secretion, cause still greater feebleness, and eventually attenuate the frame.

According as more or less of nutritive plethora becomes combined with this state, the constitutional efforts are greater, and various degrees of febrile and inflammatory excitement ensue. In proportion as this excitement is energetic, and as suitable means are employed to relieve it, is the vitiated state of the blood corrected, secretions and excretions are improved, and general health and strength are renewed. Increased secretion from the bowels seems the principal discharge by which nature in general aims at getting rid of such impurities, and to promote them by suitable purgatives is clearly indicated, care being taken at the same time to support strength by light yet nutritive diet. When relief to a certain extent is thus afforded, the powers of the constitution rally, and a febrile effort is made to assist in the work of purification. As this advances, depletion requires to be more active, and the diet less stimulating. When sufficient excitement is aroused to warrant the employment of bloodletting, we may then consider the curative process in the most favourable train. Perhaps the powers of the constitution are hardly adequate to rectify any high degree of this peculiar derangement, without the agency which febrile excitement supplies; and hence we see experienced practitioners often hail the appearance of febrile symptoms in chronic complaints, as announcing a more remediable form of disease.

These remarks on excrementitious plethora, though cursory and imperfect, will suffice to prepare the way for the remaining discussion of gout. To pursue this methodically through all the alleged varieties would be both tedious and valueless. If the principles be clearly laid down, there can be little difficulty in applying them to whatever variety or complication of the disease may present itself.

On a first accession of gout it should be the inflexible determination of the party assailed never to subject himself to a return. That this is practicable is abundantly proved; and if the means so clearly pointed out be not employed, blame should not be imputed either to the inveteracy of the malady or the imperfection of medical science. Nature has endued all matter with determinate properties, and living beings are subjected to certain organic laws, by obedience to which health and physical welfare are maintained, while a violation inevitably begets disease. They who will neither learn those laws, nor abide by them when proclaimed, must suffer the penalties of their own ignorance and perverseness.

When successive attacks of gout have taken place, the hope of effecting complete exemption must be sensibly weakened. Still, if there be no disorganization, the end may yet be attained, and at all events the attempt to accomplish it will be amply repaid; for should attacks recur they will be slight, at long intervals, easily subdued, and will commit no ravages, but leave the general health and even the gouty limbs tolerably sound.

Disorganizations of course enhance greatly all the difficulties. They evince a more confirmed gouty diathesis; the local weakness encourages renewed seizures from slight causes; and the impediment to active exercise cuts off one of the most efficient prophylactic agents. In this state of gout, then, too much should not be attempted, either by bloodletting or abstinence. Active symptoms should be met with such certainty of practice as the accompanying state of constitution may warrant. Fever should be allayed, local inflammation abated, and general health restored as speedily as possible; but all due regard should be given to the degree of constitutional power existing.

In the wretched cases of extreme disorganization, broken health, and exhausted power, no one would think of employing any but palliative treatment; but even this will be beneficial in proportion as it is guided by the principles maintained throughout this essay. So long as there is encouragement to employ bloodletting as part of the treatment, will benefit result from resorting to it. In cases in which the danger to be apprehended from its use is greater in degree than the expectation of benefit, other means must be substituted; and here colchicum is of inestimable value, supplying the place of more active and efficient treatment better than any other drug with which we are acquainted.

As a healthy state of each function is the standard with which the several derangements should be compared, and which it should be the endeavour to restore, care should be taken to ascertain by direct evidences that each is actually restored to the efficient exercise of its powers. The pulse, skin, and tongue, will demonstrate with sufficient accuracy whether fever is subdued, and will thus afford evidence of the circulation being, for the time at least, restored to its healthy balance. To maintain this ground, however, assiduous care should be devoted to the several excretories, all of which should perform adequately their several functions. The skin, bowels, and kidneys should be active, and their respective efficiency should be attested both by the quantity and quality of their several excretions. Each of these should receive more continued attention than is usually given to them, for if duly noticed, they would announce the advance of disease long ere depraved sensation or other prominent derangement indicate its approach, and would thus lead to a more timely and effective use of suitable correctives.

A closer attention to them, also, during convalescence, would contribute much to render recovery more perfect, and lessen the liability to renewed attack.

The skin should be active, for it is an outlet for the discharge of excrementitious matter of the highest importance. The most effectual and salutary means of keeping it so is active exercise. Warm bathing is a valuable assistant, and eminently so when but little exercise can be taken. The condition of the skin itself should be regarded. In many, large portions of its surface are hard, dry, scaly, and utterly impermeable. These should be restored by warm bathing, by such applications as soften the cuticle, and by frictions both with the hand and the flesh brush. The thorough desquamation of cuticle effected by the process of the Russian vapour-bath, would be a valuable means of restoring many an imperspirable skin to the full exercise of its functions. A freely perspirable skin is powerful in obviating plethora both nutritive and excrementitious.

The bowels should perform effectually the duty which nature assigns them, and in this respect attention is much needed, for considerable depravation is continually suffered to go on unchecked and unheeded. The amount and frequency of stools are too much trusted to as evidences of healthy bowels, while the only one to be relied on is the character of the matter discharged. When this, however sufficient in quantity or regular in discharge, is dark, foul, and charged with mucus, evacuant or alterative medicine is needed, however free the party may be from every other symptom of disease. By this neglect much disease creeps in, and many a constitution is undermined where timely and judicious attention to the bowels would avert all the mischief.

In like manner the urine merits attention, and more especially from the tendency which there is in gout to throw off morbid matter by this outlet. Much profitless scrutiny has been devoted to the different impregnations, the specific gravity, and other properties of gouty urine. The main fact respecting it is that it contains what ought not to find its way into it, and the most effectual way of purifying it is to cut off the morbid supplies by regulating the diet and restoring due activity to the other excretories, for it is their deficiency which throws upon the kidneys so much extraordinary labour. Light diet, a free skin, and active bowels will clear the urine with little aid from chemical correctives. These are, no doubt, proper as adjuvants, where high degrees of acescency or of alkalescence prevail; but they are utterly inadequate for perfect corrections, and their use at best, if alone trusted to, is uncertain and short-lived. We have no evidence that when taken by the mouth they ever reach the bladder so as to act on the concretions deposited there. This truth the history of calculous complaints establishes. From the same source we learn that when acid calculi cease to be deposited in consequence of the free use of alkalies, if these be continued, alkaline depositions take place, and thus the evil is changed, not removed. Both in calculus and gout our belief is that more may be done in correcting the morbid state of urine, by re-establishing a healthy balance in the constituents of the blood, avoiding all excess of diet or stimulants, and keeping up an active state both of cuticular and intestinal excretion, than can ever be effected by neutralizing remedies. These should not be withheld, but from the circumstance before mentioned caution is required in their use, and at all events they should not, however efficient they may casually appear, be suffered to supersede the far more effectual relief which rectifying the fundamental errors of the constitution is capable of affording.

Little more is needed to complete the discussion of gout, the principles maintained in the foregoing pages being applicable to all the forms in which the disease can present itself. It has been already stated that these complex conditions and alleged varieties are referable, not intrinsically to gout, but to the state of constitution in which it occurs; and to the constitutional derangements should the treatment be directed, without bias from the imputed cause. The varieties, when scrutinized, will be found to consist of gouty tendencies combined with visceral affections and with more or less of debility; and in treating them the object should be to restore general health, and thus reduce whatever gout there may be to its simple and intelligible state, rather than aim at improving health by any specifics supposed to act directly on gout. The latter mode has been tried sufficiently long and by sufficient variety of means to prove its utter inefficiency, and deprive it of all confidence. The history of specifics and their effects would furnish a lamentable display of error and its consequences. The Portland powder appeared to cure, but the result of Dr. Cullen's inquiries was that not one of those who were so cured survived three years. Some died suddenly, while others were attacked with apoplexy, palsy, asthma, hydrothorax, general dropsy, or general cachexia. In this conclusion both Dr. John Gregory and Dr. James Gregory were led by their investigations to concur. The ravages occasioned by the eau medicinale are of too recent date to need more than a casual mention.

According as the general health is broken, and the power of bearing active treatment weak, must gouty patients abate in their expectations of cure, and be content to mitigate their sufferings by such means as sound principles sanction; and by adhering to these much may be done even in extreme cases. In all may fever be allayed, plethora prevented, the bowels kept free, the skin perspirable, and contingent derangements receive their appropriate correction.

In proportion as the natural vigour is slight, or reduced by excrementitious plethora, must depletory treatment be cautiously applied to recurring paroxysms; for no promptitude of relief could justify the hazard incurred by even an approach to excessive evacuation. While we contend for the inflammatory nature of gout, and the decided propriety of combating the active disease with proportionally active treatment, we are far from inculcating a rash or indiscriminate use of the lancet, but on the contrary would employ it with great caution, and only under those circumstances in which repeated experience had established both its safety and utility. With a full hard pulse, hot skin, and furred tongue, we would bleed, purge, and give colchicum without hesitation. Even where inflammation was less strongly marked we would employ the same means, provided the evidences of plethora and of febrile excitement were sufficiently discernible; and this treatment has in our own practice had perfect success in abridging the paroxysm, accelerating convalescence, restoring speedily the affected limbs, and greatly prolonging the period of exemption, even in cases of long continuance, where the duration, succession, and severity of paroxysms had induced such helplessness and decrepitude as confined the parties to the couch for two-thirds of the year. The vigour of constitution being the standard by which depletion should be regulated, it follows that when such vigour is deficient, measures of the same activity should not be pursued as are necessary when the habit is robust. In extreme cases, where natural languor and feebleness are confirmed and increased by the effects of excrementitious plethora, when muscular debility is great, the pulse low, soft, faltering, the tongue moist, clean, of a bright red colour, or scarcely whitened, the bowels inveterately foul, the gouty effort feeble and imperfect, —in such cases wine, stimulants, and invigorating regimen must supersede every evacuation save purging. The object in such cases should be to renovate the frame by improving the bowels and giving tone to the whole system. Should the gouty effort, in consequence of such regimen, become more vigorous, and marked by clear evidences of renovated powers, then may an approach be made to the more effective treatment by which gout is so signally relieved.

With respect to the nosological varieties, they may be dismissed with very few observations. Cullen has recognised them; namely, the atonic, retrocedent, and misplaced. The atonic is marked by general debility, feeble attempts to generate a paroxysm, and visceral derangements, chiefly gastric. Light food, regulation of bowels, and the several means suited for improving the stomach and giving tone to the general system, should be the means here resorted to. Light tonic medicines may be combined, but they are of little avail, and they should neither be given largely nor too long continued. The condition of the stomach is here analogous to what obtains in gastrodynia, to which head we may refer for the treatment which this derangement requires. What is generally called gout in the stomach is but a high degree of this affection; and when the spasm is intense, with prostration of strength, the strongest stimulants, such as brandy, ether, and laudanum, may be necessary to allay it. Immediately after, however, the stomach should be effectually cleansed of its mucous accumulations by full doses of calomel, antimony, and colocynth; and light cordials with aperients should follow rather than direct stimulants or tonics. When there is great debility of stomach, chalybeates may be required, and they are best administered in the form of some natural or artificial mineral water. It is in such cases that the internal use of the Bath waters is so eminently serviceable, although they are valuable in most gouty cases, especially where the stomach requires some substitute for the wine and stimulants relinquished. In such cases the grateful stimulus of the Bath waters gives tone to the stomach, improves appetite, and renovates strength, thus accomplishing an unequivocal good; not, as has been falsely imagined, by the mere establishment of gout in the extremities, but by the reduction of gout to its simpler and more manageable state through the amendment effected in the general health. This advantage is great, provided it be rightly understood. If the mere gouty accession be the object desired, and that on its appearance the end is considered as attained, then indeed the benefit is but slight and transitory, while the false experience thence derived serves but to confirm error and perpetuate evil. But if the accession, when thus elicited by means of renovated powers, be regarded as it ought, and properly treated, the opportunity thus afforded for resorting to efficient measures is most valuable, and the Bath waters, so instrumental in procuring it, should receive the credit to which they are so justly entitled. It is curious to observe the fluctuations which take place in public opinion respecting the value of mineral springs. They become fashionable and again decline, not from any variability in their properties or medicinal effects, but from the misconceptions and caprices to which ignorance is prone. It is lamentable to think how great is the ignorance of the public in all that relates to the structure and functions of their own frames, and how very inconsiderable a portion the science of animal life forms even of that course of instruction which our highest seminaries supply. Formerly Bath was the general resort of gouty patients in all stages and degrees of the disease. The object was not to cure gout, but to excite and hasten it; and as this effect was often produced, their reputation became established. In time it was discovered that in full habits and inflammatory states of constitution their agency was not always limited to bringing on gout, but that other excitements less harmless were apt to ensue. The local practitioners were therefore constantly obliged, in the conscientious discharge of their duties, to withhold the internal use of the waters, however they might allow their external application; and patients who were sent to Bath expressly to drink the waters were naturally disappointed. It came to be doubted, also, whether bringing on the paroxysm was to be considered an unmixed good; and this approximation to just views gave rise to further hesitation respecting the expediency of using the Bath waters. The consequence is that though vast numbers still resort to Bath for gouty complaints, the waters are not held in that high estimation in which they were wont to be regarded. Yet they still retain all the virtues which they ever possessed; are still capable of rendering most valuable services to gouty constitutions, nay, of effecting, in the improvement of stomach and renovation of strength, what no course of medicine, nor any other mineral spring in these countries, could equally accomplish; and there is no reason, save the capricious fluctuations of opinions, why they should not still maintain the high character which they formerly possessed. The objects in administering them may be different, but the effect of this must be to render them only the more serviceable.

Gout has been called retrocedent when the sudden subsidence of the gouty inflammation has been followed by sudden affection of some internal organ or function. Such affection is no doubt liable to occur whenever the local inflammation is repelled without the constitution being adequately relieved. Where it happens, it requires to be treated precisely as if gout were not concerned. If the substituted malady be marked by spasm and sinking powers, cordials and stimulants must be used; if by inflammation, then must bleeding and purging be employed to the full extent which the urgency of symptoms may demand.

The term misplaced gout seems to have been employed without any sufficient reason. It has been applied to any and every incidental disease occurring in a gouty habit. For the most part such disease has been inflammatory; and when it has attacked the stomach, lungs, or brain, practitioners, impelled by the urgent danger, have not hesitated to bleed freely, however repugnant to such practice their ordinary views of gout might be. It would be difficult to reconcile this practice with the extreme timidity which shrinks from the employment of bloodletting when the inflammation of active gout is situated in the extremities.

E. Barlow.

GRAVEL.—See Urine.

[GREASE POX.—See Glanders.]

GUTTA ROSEA, or ROSACEA.—See Acne.

HÆMATEMESIS.—This term (derived from *αἷμα* and *ἐμέω*) literally imports vomiting of blood, and is therefore properly employed to signify hemorrhage from the stomach. Some nosologists, as Pinel and Mason Good, comprise under this denomination every hemorrhage from the alimentary canal, whether the blood is discharged by the mouth or by the rectum. It is, however, more conformable to etymology and to general usage to restrict the name of hæmatemesis to *gastric* hemorrhage, and to denote *intestinal* hemorrhage by the name of Melæna, which will, therefore, be the subject of a separate article. There is, however, much affinity between these two species of hemorrhage: and the two articles will therefore be in some measure mutually supplementary.

Hæmatemesis is frequently mentioned by Hippocrates. It is clearly described by Aretæus, and distinguished by him from pulmonary hemorrhage

Among the moderns, Stahl, Hoffmann, Morgagni, Tissot, Portal, and subsequent writers, have contributed to its elucidation. Little has been written on the subject by British physicians. Cullen has not even included this disease in his nosological arrangement, on the ground of its being almost universally a symptomatic affection; he has, however, treated of it at some length in his "First Lines," chiefly with reference to the diagnosis and pathology.

Predisposing Causes. — Women are much more subject than men to hæmatemesis, and are chiefly liable to it during the menstruating period of their lives. Those of a delicate frame, of quick nervous sensibility, or subject to strong emotions, are most prone to this disease; but the sanguine, ruddy, and plethoric are also liable to it as a consequence of defective menstruation. In some females it occurs during pregnancy. Men are seldom attacked by hæmatemesis at an earlier age than thirty or thirty-five, and very rarely after fifty. It is in them almost invariably induced by habits of life unfavourable to health, especially by close and anxious application to business, combined with indulgence in the pleasures of the table, and neglect of bodily exercise. Organic disease of the stomach, liver, or spleen, and probably also of the pancreas, will constitute a predisposition to hæmatemesis; and organic affections of the heart, especially valvular disease and dilatation, by retarding the return of the blood, and hence inducing general venous congestion, are a frequent predisposing cause of this as well as of other hemorrhages. When hæmatemesis has once occurred in an individual, from whatever cause, a predisposition is induced to its recurrence, either spontaneously, or on exposure to some exciting cause which would not in other circumstances have given rise to it.

Exciting Causes. — These may be divided into local and constitutional. The *local* causes are such as produce irritation or sanguineous congestion in the mucous membrane of the stomach, and consequent exhalation of blood; or more rarely a physical lesion of the inner surface of that organ, attended with rupture or erosion of a blood-vessel. Sauvages, Frank, and other authors, enumerate a variety of exciting causes of hæmatemesis, which are confessedly of very rare occurrence, such as the rupture of an aneurism of the aorta, or of some one of its branches, into the cavity of the stomach; the bite of a leech accidentally swallowed; wounds or irritation of the stomach from swallowing a bone, needles, broken glass, &c.; larvæ of insects introduced into the stomach, or generated there; the transmission of an electric shock through the region of the stomach. (Sauvages, Nosol. Method. Frank, de Curand. Homin. Morbis, lib. v. part ii. p. 204. Edin. Med. Jour. vol. vii. p. 326. Percival's Essays, vol. ii. p. 183.) Corrosive poisons are well known to induce vomiting of blood. Other acrid substances will probably have the same effect; and thus drastic purgatives and emetics are included in Frank's list of causes, but perhaps only from theoretical considerations. The effort of vomiting, and other violent strains and exertions, as the expulsive efforts in parturition, (Frank,) are supposed to have produced hæmatemesis. It is also a well-known effect of severe blows on the epigastric region.

The *constitutional* causes are those which, by some effect, not always easy of explanation, on the sanguiferous system, produce congestion in the vessels of the mucous membrane of the stomach, or a tendency in the blood to escape from them. Violent, and especially *strongly concentrated* mental emotions, as grief, anger, or terror, are undoubtedly exciting causes of hæmatemesis, though probably only in the predisposed. In some malignant fevers, in scurvy, and in purpura, hæmatemesis occurs as a symptom, evidently from a constitutional cause. But the most frequent instance of such a cause operating in the induction of hæmatemesis, is, where it results from the suppression of some natural or habitual evacuation, especially of the catamenia in females, and of the hemorrhoidal discharge in either sex. The connection of hæmatemesis with amenorrhœa has been remarked ever since the time of Hippocrates; and there appears to be no just ground for the denial of this connection by Dr. Hamilton, in his work on Purgative Medicines. Hæmatemesis very commonly supervenes on a *suppression*, from whatever cause, of menstruation already established, and which had hitherto observed its regular periods. In other cases it is related to have attended upon *retention* of the menses, (Frank, op. cit. p. 206,) but such instances are comparatively rare. (See AMENORRHŒA.)

Symptoms. — The attack of hæmatemesis is sometimes unattended by any premonitory signs, the vomiting of blood being the first morbid symptom which occurs. But more frequently it is preceded by symptoms similar to those which precede ordinary vomiting: anxiety, faintness, a sense of weight and distension, sometimes amounting to dull pain in the epigastric region; and distressing nausea. The pulse is frequent, but commonly small and weak; and on inquiry it will be found that the bowels are costive. Sometimes there is general chilliness, with particular coldness of the extremities, vertigo, impaired vision, and ringing in the ears; but several of these symptoms ought, perhaps, rather to be considered as indications that internal hemorrhage has actually taken place, than as precursory signs of its occurrence; for rejection of the effused blood by vomiting does not ensue, until either by its quantity or stimulus it excites the stomach and abdominal muscles to contraction. (Chomel, Dictionnaire de Médecine, tom. x. p. 555.) The blood is then brought up with considerable violence in successive fluid gushes, or partly in solid coagula. Sometimes a single large coagulum is brought up, in fact a mould of the stomach. The quantity rejected by vomiting is always considerable, being seldom less than eight or ten ounces, and sometimes amounting to several pounds. It is highly probable that hemorrhage from the stomach may take place in smaller quantity; but then the blood passes off by the pylorus without giving rise to vomiting. The blood is of various shades of colour, from a deep red to nearly black, according to the shorter or longer time that it has sojourned in the stomach, and probably from other causes. It is not to be supposed that when the blood is dark-coloured, it is necessarily the result of *venous* hemorrhage. This was pointed out by Aretæus; and it is well known that the fluid, and especially the gaseous contents of the stomach and intestines, will impart a dark colour to blood which remains for any time mixed with them. When there has been a sufficient delay for separation of the constituent parts of the blood to take place in the stomach, membranaceous or polypus-like concretions of fibrin are occasionally brought up along with the blood. (Frank, op. cit. p. 202. Dict. de Méd. loc. cit.) It is often mixed, as might be expected, with alimentary matters, with bile, or with the mucous secretions of the stomach. Most commonly blood is vomited only once in the course of a single accession of hemorrhage; but sometimes a repetition of the vomiting occurs after a short suspension. After the vomiting has subsided, the accompanying symptoms commonly cease, leaving the patient in an exhausted state, with a cold surface, pale countenance, and generally considerable mental agitation and alarm, especially in a first attack. Actual syncope, as Frank has noticed, not unfrequently ensues.— Part of the effused blood usually passes the pylorus, and after a few hours produces slight tormina and distension in the course of the intestines, followed by two or three dark-coloured and offensive stools, resembling those in melæna. This appearance of the alvine discharge will continue for twenty-four or sometimes forty-eight hours.

Death has very rarely directly ensued from the loss of blood in an attack of hæmatemesis; but the repeated attacks of this hemorrhage have necessarily a tendency to weaken the constitution, particularly when it is not of a vicarious character. Sometimes after a single attack there will be no recurrence of hemorrhage; but more commonly, as we have already observed, a predisposition to its return is induced, and it will after some interval reappear either spontaneously, or on the application of some exciting cause; or it will assume a periodical or chronic form, according to the nature of the local, constitutional, or organic cause by which it is kept up.

From the above account of the causes and symptoms of hæmatemesis, it will appear that it has generally the character of a *passive* hemorrhage. Sometimes, however, it occurs in individuals of vigorous constitution, is attended with symptoms indicative of increased impetus of the circulation, and puts on the type of *active* hemorrhage. This distinction is not always very clearly marked, but it is highly deserving of attention, with a view to the treatment.

Hæmatemesis has also been divided into *idiopathic* and *symptomatic;* but these epithets have been used by different writers in widely different senses. The most important practical distinction is that derived from the several predisposing and exciting causes, and states of the constitution which give rise to the hemorrhage. These it is always highly important to ascertain.

Pathology.—As the general doctrine of hemorrhagic diseases will be developed in another place, (see Hemorrhage,) we shall confine our present inquiry to those circumstances which are peculiar to this individual disease.

Hæmatemesis, when unconnected with organic lesions, so very rarely proves fatal, that anatomical investigation has thrown but little light on t state of the stomach and its mucous membrane this disease. Frequently no morbid appearan whatever can be detected in patients who ha died very shortly after profuse hæmatemesis. other cases, *redness* of the mucous membra could alone be discovered; but this may be t effect of simple infiltration of blood, while in oth cases it may denote a congestive, or even an i flammatory state of the mucous membrane, whi has caused the hæmatemesis. In some of t dissections recorded by Morgagni and Portal, t stomach and other viscera, after profuse hæma mesis, were found remarkably pale. Some o servers have recorded a dilatation of the veno and arterial branches supplying the stomach as common appearance after death from hæmatemes and the veins ramified on the internal surface that organ have been even described as in a va cose state; but these allegations are destitute adequate proof.

In those cases of hæmatemesis which are co nected with organic affections, whether of t circulating system or of the abdominal visce the appearances proper to these diseases will course be met with after death. Where the h matemesis has arisen from organic disease of t stomach itself, it has commonly been suppos that it was the consequence of ulceration, p ducing the rupture or erosion of one or mo blood-vessels. Such cases, no doubt, are occ sionally met with; but it is no less certain th scirrhus of the pylorus often proceeds to extensi ulceration without the occurrence of any hæma mesis; and on the other hand, as Andral fro ample experience assures us, that scirrhous aff tions of the stomach are attended with repeat hæmatemesis during their progress, where, on d section, no ulceration nor lesion of continuity the mucous membrane or its vessels is observab (Andral, Pathol. Anat. transl. vol. ii. p. 179.)

Hæmatemesis is, then, an instance of *exha tion* of blood from a mucous surface, analogo to what happens in epistaxis and hæmaturia, uterine, and many cases of pulmonary and bro chial hemorrhage. The causes which occasi this exhalation are referred by Andral to fo heads:—1, a mechanical obstacle to the return the venous blood through the system of the ve portæ;—2, irritation of the mucous membrane the stomach;—3, sanguineous congestion, not ferrible to either of the former heads;—and, certain states of the blood itself, in which it is changed as to have a universal tendency to esca from its vessels. (Pathol. Anat. transl. vol. ii. 179.)

Mechanical congestion is instanced (1.) in tho cases of hæmatemesis which depend on enlarg ment or induration of the *liver*, and sometim also of the *spleen* or *pancreas*, in consequence which the trunk or branches of the venæ por are more or less directly compressed, and the turn of the blood from the stomach impede hence congestion in its vessels and hæmateme ensue. (2.) In cases depending on obstruct circulation from organic disease of the *heart*, a more especially from morbid alterations in valves, or dilatation of its cavities, in consequen of which the return of blood by the vena cava impeded, and general venous plethora is induced. (Ibid. vol. i. p. 64.) Such a state is now well ascertained to be a frequent cause of hemorrhage, especially from the lungs, the stomach, and the uterus; and its existence is a circumstance deserving the most careful attention of the scientific practitioner.

Irritation of the mucous membrane is the direct cause of the hæmatemesis arising from corrosive poisons and other acrid substances.

To *simple congestion* we must, in the present state of our knowledge, refer all those cases of hæmatemesis which are considered as *idiopathic*, including those which are *vicarious*, or *auxiliary* of suppressed or diminished menstruation, &c. "The blood," says Andral, "accumulates in some part of the mucous membrane, and escapes from its vessels, which is all that we can discover."

The subject of *morbid changes of the blood*, will be discussed in other parts of this work. (See BLOOD, PURPURA, SCURVY.) Andral instances, as cases where hæmatemesis results from this cause, "certain cases of poisoning by absorption," typhous fevers, and the black vomit in yellow fever.

Diagnosis. — Hæmatemesis is in general easy to be recognised by the symptoms already enumerated. It is occasionably liable to be confounded with hæmoptysis. "It may be certainly known," says Cullen, "that the blood proceeds from the stomach, and not from the lungs, when it is manifestly brought up by vomiting, and not by coughing; when the vomiting has been preceded by some sense of weight, anxiety, and pain in the region of the stomach; when the blood brought up is of a dark and grumous appearance; and when it is manifestly mixed with the contents of the stomach." (First lines, § 1017.)

When, also, cough and the other local and constitutional symptoms of pulmonary hemorrhage are absent, we may in general safely conclude the case to be hæmatemesis. There are, however, several circumstances which may tend to perplex the diagnosis. Cough and vomiting will materially excite each other, and when they jointly occur, it may not be easy to decide which is the primary symptom and by means of which of them the blood is brought up. In very profuse hæmoptysis the muscles of the thorax will sometimes contract convulsively, so as to send forth the blood in successive gushes, closely resembling what takes place in true vomiting of blood; or the blood brought up by coughing may tickle the fauces, and excite actual vomiting. On the other hand, blood brought up by vomiting may be driven back into the glottis, and excite violent cough. We must also recollect, in order to guard against all error in diagnosis, that the blood, though actually vomited up from the stomach, may be originally derived from a different quarter, as in the case of aneurism already adverted to, or where blood proceeding from the fauces or posterior nostrils has been swallowed during sleep, or is transmitted from a vomica in the lung by a fistulous canal into the œsophagus, as in a remarkable case related by Dr. Mackintosh. (Practice of Physic, vol. i. p. 186.)

Hemorrhage from the stomach, as has been already mentioned, does not necessarily imply the rejection of the blood by vomiting; for in the first place the quantity of blood exhaled into the cavity of the stomach may be so inconsiderable as not to excite vomiting, and pass off by the intestines; and, secondly, in very debilitated states of the constitution, the relative loss of blood may be such as instantly to destroy life, before any vomiting has taken place. This chiefly occurs in cases of ulceration of the stomach, which organ is found after death distended by an enormous coagulum. Such cases are not of very rare occurrence.

The diagnosis of hæmatemesis is not complete for practical purposes until we have endeavoured to ascertain to what specific cause the hemorrhage is to be ascribed, and whether it be idiopathic or symptomatic, connected with organic lesion or simply with deranged function, and whether it partakes of the character of *passive* or *active* hemorrhage. Attention is therefore required to what has been pointed out on these several heads.

Prognosis. — Hæmatemesis is always a disease of formidable and alarming appearance, from the quantity of blood which is lost, and the delicacy and importance of the organ concerned. Experience, however, instructs us that in many cases it is attended with little danger. Hæmatemesis which is vicarious or supplementary to menstruation is usually a very manageable complaint; though we cannot go so far as some of the older authors, who considered it as absolutely salutary, and not to be interfered with. (Salmuth, Langius, Zacutus Lusitanus, &c. See Dict. des Sciences Médicales, vol. xx. p. 100.) Where, on the other hand, it is not imputable to suppressed evacuations; where it shows a tendency to assume a chronic form; where it is attended with fever or indications of organic lesion; hæmatemesis is a disease of considerable danger, and very difficult of cure.

Treatment. — The treatment of hæmatemesis divides itself into three heads: — 1. prophylactic measures; 2. those proper at the time of an attack; 3. those suitable in the intervals, or after the hemorrhage has subsided.

1. When warning is given of the approach of an attack of hæmatemesis by any of the precursory symptoms already noticed, it will be proper to have recourse to timely preventive measures, and especially to prescribe rest and the antiphlogistic regimen, cooling drinks, warm pediluvia or fomentations to the extremities, saline or other purgatives, and, if indicated, the abstraction of blood. Small bleedings have been particularly recommended a day or two before the time at which the catamenia ought to recur, if it is apprehended that they will be replaced by hæmatemesis.

2. The attack of hæmatemesis must be met by remedial measures of the same kind as those which are suited to hemorrhagic diseases in general; and their use must be modified by the character of the hemorrhage, the symptoms by which it is accompanied, and the causes which appear to be concerned in its production.

If there are clear indications that the hemorrhage is of an *active* or inflammatory character, venesection must be promptly resorted to, and followed up by purgatives and a strict antiphlogistic regimen. If, on the contrary, the disease puts on a *passive* or asthenic character, and the constitutional powers evince a tendency to sink rapidly, we must have early recourse to the most efficacious astringent remedies, and support the strength by mild but invigorating nourishment, and even cordials, given in small quantities, but frequently. In cases of an intermediate nature, the judicious combination and modification of these two plans of treatment demands the discrimination and skill of the practitioner. Thus it may be necessary to reduce local action by leeches, cupping, and mild laxatives, while proper dietetic means are resorted to to support the strength.

In all cases the most perfect mental and bodily tranquillity must be enjoined, and the patient strictly confined to the horizontal posture, in a cool and well-ventilated apartment, and with as light coverings as possible. Castor oil, the neutral salts, or more active purgatives, are to be administered according to circumstances; or where the irritability of the stomach forbids their use, laxative clysters must be resorted to, to secure an open state of the bowels. Cold liquids, as lemonade, almond emulsion with nitre, or the superacidulated infusion of roses, may be given frequently in small quantities, as a tea-spoonful or dessert-spoonful at a time.

In cases where the hemorrhage is so profuse and violent as to threaten serious consequences, more active measures must be resorted to; and none is so deserving of confidence as the free application of *cold*, which is the most efficacious of all astringents, by diminishing the calibre of the blood-vessels and lessening the impetus of the circulation. We must, therefore, not only give the liquids just mentioned, cooled down to 32° by ice or a freezing mixture, but may with great advantage inject iced water into the rectum, and lay bladders filled with pounded ice on the epigastric region. A very interesting case is related by Michelotti, in the Philosophical Transactions for 1731, in which a young gentleman affected with enlarged spleen, and previously subject to epistaxis, was cured of a second attack of profuse hæmatemesis, in the winter season, by drinking excessively cold water, and taking alimentary liquids iced. The quantity of blood vomited in the space of two hours is said in this case to have amounted to twelve pounds and upwards. By means of occasional small bleedings, a fresh attack was averted for two years, at the end of which period the hemorrhage recurred, and was again subdued by the same means. In the remarks appended to this case, the author cautions us against resorting to this powerful remedy in asthenic or dyspeptic individuals, but strongly advises its use in young and vigorous constitutions, and in the active form of hemorrhage.*

[Certain of the saline preparations, as supersulphate of magnesia, potassa or soda, which may be formed extemporaneously, (*Magnes. sulph.* ʒiii; *Acid. sulph. dil.* gtt. xxx; *Aquæ* f.℥vj. M. Dose one quarter four times a day,) by coming in contact with the vessels that pour out the blood by rupture or transudation, arrest the hemorrhage by their stringent action, and are thus both astringents and revellents; whilst by their cathartic agency they, at the same time, remove from the intestinal canal any effused blood that may have passed into it from the stomach. In cases, too, of hæmatemesis that are dependent upon amenorrhœa, the cathartic may act beneficially by contiguous sympathy, on the torpid uterus.]

It is, on the contrary, in the *passive* kind, and in relaxed and languid subjects, or where the impetus of the circulation has been already reduced by venesection and antiphlogistic measures, that the vegetable and mineral astringents may with safety and advantage be employed. In hæmatemesis we have the great advantage of applying these remedies directly to the seat of the hemorrhage; and, therefore, they may be the more relied upon. Preparations containing gallic acid, such as Ruspini's styptic, (which Dr. A. T. Thomson has ascertained to be a solution of this acid in diluted alcohol,) are probably the most useful of the vegetable astringents. But no remedy of this class deserves so much confidence in passive hemorrhage as the acetate of lead given in combination with opium, and in such large doses and at such frequent intervals as to secure its effect. (See ASTRINGENTS.) Dr. Elliotson, who strongly advocates the *free* employment of this remedy, also mentions, as one from which he has derived great benefit in hæmatemesis and malæna, the oil of turpentine, in doses of twenty drops, repeated every three hours. (Elliotson's Lectures, Medical Gazette, vol. ix. p. 525.) Subnitrate of bismuth, in conjunction with opium, has also been recommended.

3. After the hemorrhage has subsided, or in the intervals of its occurrence, we must endeavour to obviate its return by removing or weakening the exciting causes, and counteracting the predisposition to the disease. A strict regulation of the diet, (passing very gradually from the mildest liquids to more nutritious food,) rest, quietness, the horizontal posture, cooling and astringent beverages, will be proper for several days after the hemorrhage has ceased. The bowels must be kept properly open by the gentlest and at the same time most effectual means; and there can be no doubt that the recommendation of clysters, to clear the intestines of the blood lodged in their course, so much insisted upon by continental physicians, is a judicious and salutary practice. We cannot, however, in this country, go along with them in their unanimous and strong condemnation of *purgatives* in every case of hæmatemesis, at least of such as are more active than manna, cassia, and tamarinds. "Quæ vi alvum movendi majore instructa sunt, ea," says Frank, "cane pejus et angue vitanda sunt." (Op. cit. p. 221.) And other continental writers, from Hoffmann down to Pinel, are not less explicit in their reprobation of active, and especially aloetic purgatives. (See Dict. des Sciences Méd. tom. xx. pp. 120, 121.) British practitioners, especially since the publication of Dr. Hamilton's treatise, (Observations on Purgative Medicines, Edinburgh, 1805,) have placed great confidence in active purging as the best mode of treatment in many cases of hæmatemesis, more particularly in that form of the disease which occurs in young and middle-aged females, and is connected with uterine torpor and a sluggish action of the bowels. In such cases Dr. Bateman states as the result of his experience, that the suc-

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* Philosophical Transactions, vol. xxxvii. p. 129.—Ploucquet refers to two cases cured "gelidissimo potu;" —1. Act. Nat. Curios. vol. iii. obs. 61; 2. Commerc. Liter. Noric. 1732, pp. 294, 351, 381.

cess of Dr. Hamilton's mode of treatment is more decidedly conspicuous than in any other disease in which he has recommended it. (Reports on the Diseases of London, p. 150.) It is remarkable that the benefit of the purgative plan of treatment is not confined to sanguine and plethoric subjects; it is not less signal in chlorotic and leucophlegmatic habits. It is, however, to female cases exclusively that the observations of Hamilton and Bateman apply; and there can be no doubt that the inconsiderate employment of active purgatives in cases of hæmatemesis or melæna occurring from wholly different causes, especially in constitutions exhausted by excess, or debilitated by the progress of organic disease, would be highly pernicious. In such cases certainly the more cautious procedure of our continental brethren is to be commended.

With regard to the restoration of the menstrual function where its suspension gives rise to hæmatemesis, the means by which this is to be accomplished are rather such as act by removing a condition of the general system unfavourable to regular menstruation, than by the employment of specific emmenagogues. If, therefore, the amenorrhœa depend on vascular fulness, we resort to bleeding and suitable purgatives; if on uterine torpor and a chlorotic state, the warmer aperients and tonics, especially the preparations of iron, are to be employed. (See Amenorrhœa, Chlorosis, and Emmenagogues.)

To complete the recovery of the convalescent from the various forms of hæmatemesis, tonic medicines, a suitable diet, exercise, change of air, and sometimes the use of chalybeate mineral waters, will be highly serviceable. But it is not necessary to protract this article by dwelling on these familiar topics. Freedom from care, anxiety, and causes of mental irritation, is of the highest importance in all cases, and especially where we have reason to believe or suspect the existence of organic disease. In such melancholy cases the utmost that our art can aim at is to palliate suffering, to ward off the recurrence of hemorrhage, and to protract to the utmost that fatal event which the resources of medicine, however skilfully wielded, cannot hope to avert.

George Goldie.

HÆMOPTYSIS, from *αἷμα*, *blood*, and *πτύσις*, *spitting.*—Were it taken in the full latitude of its etymology, the word hæmoptysis would embrace every discharge of blood from the mouth, without regard to the sources from whence it originally proceeds; but as the sources are various, use has annexed to the term a more limited signification, restricting it to *expectoration of blood*, or that which originally issues from the respiratory organs. This view of the subject has suggested to some the propriety of substituting the term *pneumorrhagia*, as more definite and precise in its signification. We, however, do not recognise, in the proposed substitution, advantages sufficient to counterbalance the evil of disturbing a well-established name. Were we disposed to make any change, it would be to divide the subject into pulmonary hemorrhage and hæmoptysis; the former expressive of the more profuse discharges of blood, the latter of the smaller quantities discharged as sputa. Still we prefer the general term hæmoptysis taken in its conventional signification.

If there be no subject within the extended field of pathology upon whose precise nature the advancement of anatomical knowledge has thrown more light than hemorrhage, there is unquestionably no organ in the body that has derived more benefit from this circumstance than the organs subservient to respiration, which, both from their organization and from the nature of their functions, are more frequently than any other the subject of hemorrhage.

The term *hemorrhage*, (*αἱμοῤῥαγία*, from *αἷμα*, *blood*, and *ῥήγνυμι*, *to break*,) carries upon its face evidence of the imperfect views which prevailed respecting the real nature of this morbid phenomenon, implying rupture of a vessel to be its essential cause; but experience, so far from establishing this as a general cause, has proved it to be of very rare occurrence, even under circumstances which we should have supposed most likely to produce such a lesion. This pathological error has been kept up in the application of the expression "bursting a blood-vessel." Speculation and vague hypothesis filled up the imperfect measure of information upon this important pathological subject, until the invaluable labours of Bichat redeemed it from error, and placed it in its true light. In explaining the phenomenon of exhalation, he has shown that it is effected through the instrumentality of a system of vessels which are continuous with the arteries, namely, the *capillaries*; that these vessels enter into the composition of all our organs; that they become elements of the several tissues of the body; and that their function consists in separating from the blood a fluid peculiar to the tissue of which they form part. Thus the mucous exhalants separate mucus, and the serous serum; and as long as these vessels continue in the unimpaired enjoyment of their vital properties, so long they only admit the colourless fluids, and refuse entrance to the red particles of the blood; but should these properties be so affected, either directly or sympathetically, that they are either altered or impaired, (changes to which they are especially subject from their being more under the influence of the nervous system than any other portion of the vascular apparatus,) they no longer retain this power of closing themselves against the entrance of red blood. In one case they as it were solicit the presence of this fluid, and in another yield to its forced entrance; in the former instance giving rise to *active*, in the latter to *passive* hemorrhage. Between the first of these morbid conditions and inflammation the closest analogy exists: they recognise the same causes; occur most frequently in the same tissues; have often the same symptoms and terminations; and not unfrequently pass into each other.

These considerations lead to the conclusion that the disposition of an organ to hemorrhage is in a ratio compounded of the development of the exhalant vessels in that organ, and of their exposure to the operation of causes capable of producing those changes in their properties upon which hemorrhage, whether active or passive, is found to depend. Applying this to the lungs, we have a ready and satisfactory explanation of the frequency of pulmonary hemorrhage. These organs combine in themselves every condition favourable to the production of this morbid phenomenon, both in its active and passive form: 1. a considerable extent of mucous membrane, the tissue the most richly furnished with exhalant vessels of any in the animal economy; 2. the constant and immediate relation of this tissue with the atmosphere,—a source of irritation not only from the variations of temperature of which it is so susceptible, but also from the different impregnations with which it is continually charged; 3. a loose spongy parenchyma traversed by numerous blood-vessels of every dimension, freely communicating with each other; 4. the proximity of these organs to the heart, and consequent exposure to the effects of every irregular motion of this organ; 5. the continued motion which the exercise of their own functions entails upon them.

In order to appreciate the disposition of the lungs to hemorrhage still further, we shall briefly glance at the two systems of blood-vessels which traverse them, viz. the bronchial or proper nutrient vessels of the organs, and the pulmonary vessels, whose office consists in the transmission of the blood through the lungs, for the purpose of its undergoing the proper chemical changes to fit it for its several uses.

The bronchial arteries are distributed to all parts of the lungs. Their trunks follow the course of the bronchi, and, sending off twigs to all the branches given off from the bronchial tube, accompany them to their ultimate termination. These numerous blood-vessels, after embracing the bronchi, penetrate their coats, and are spread out upon their mucous surface into an incredible number of capillaries. In addition to these branches supplying the bronchi, the bronchial arteries send lateral branches to all other parts of the lungs, which, passing into the tissue of the organ in connection with numerous branches of the pulmonary artery and pulmonary vein, constitute a fine network made up of innumerable capillaries freely anastomosing with each other.

The pulmonary artery, after it has pursued the bronchi to their termination, sends branches to each vesicle; and these branches, anastomosing on all sides, are spread out upon the vesicles. This artery gives off vessels which, pursuing a tortuous course between the air-cells, proceed to take their share in the composition of that network of vessels to which we have before adverted as made up of the ultimate ramifications of the bronchial and pulmonary arteries and pulmonary vein. Through the medium of these vessels, an injection thrown into the bronchial artery fills the pulmonary artery also, though its passage from the latter into the former is much more easy.

The pulmonary veins, made up of branches collected from all points to which the bronchial and pulmonary arteries carry the blood, conduct this fluid back to the heart, pursuing their course along the bronchi and their branches in the same way as the pulmonary artery.

These anatomical details explain to us, so to speak, the machinery of pulmonary hemorrhage, and enable us to understand the mode of operation of the many and different causes which produce this morbid phenomenon. They exhibit to us such a freedom of communication existing between all the blood-vessels of the lungs, that any derangement of either the general or pulmonic circulation is competent to give rise to it. In certain excitements of the general circulation the blood will be impelled through the bronchial artery, proceeding from the aorta, into the smaller vessels which are spread upon the bronchial mucous surface, and from them into the bronchial tubes. Should the derangement be more particularly confined to the pulmonary circulation, as in case of hypertrophy of the right ventricle of the heart, the blood will then be driven into the small branches of the pulmonary artery which are distributed to the parenchyma of the lung, and being exhausted there, will constitute hemorrhagic engorgement or pulmonary apoplexy; and, should the impetus be considerable, its effects will be extended to the communicating bronchial branches, from whence the blood will be poured into the bronchial tubes, giving rise to bronchial hemorrhage.—See Apoplexy, Pulmonary.

We are now prepared to understand a circumstance to which we shall have occasion to advert when we come to speak more particularly on the subject of pulmonary apoplexy. Although this affection generally consists in the extravasation of blood into the parenchyma of the organ, and of hæmoptysis more or less extensive at the same time; still this latter phenomenon may be altogether absent,* and the hemorrhagic engorgement (which is really the essence of the disease) alone be present. In fact, we regard the addition of the hæmoptysis as a mere accident, though a measure of the intensity of the cause which has given rise to the hemorrhagic engorgement; and we readily account for its frequency by the facility with which an injection is found to pass from the pulmonary into the bronchial artery. The communication which we observed to exist between the pulmonary vein and pulmonary and bronchial arteries, furnishes us with the *rationale* of hæmoptysis dependent upon particular lesions affecting the left side of the heart. Thus, from a narrowing of the communication between the left auricle and ventricle, the pulmonary vein is *prevented* emptying its blood into the auricle; and as it is the channel into which the pulmonary and bronchial arteries empty their contents, the effects of its congestion are necessarily felt in these arteries. Besides, the remora of the blood in the lungs opposes a resistance to the efforts of the right ventricle to drive its blood through the pulmonary artery and lungs, and demanding increased efforts of this ventricle, occasions its contents to be thrown with unusual force into the minuter vessels of the pulmonary artery, and the communicating minute branches of the bronchial artery: it is in this way that we explain the frequent hæmoptysis in this particular lesion of the heart. From the foregoing observations it is obvious that the blood-vessels of the lungs form a circle; and that hæmoptysis may result from derangement of the circulation affecting any part of it.

Though there is no period of life which can be strictly said to be exempt from hæmoptysis, still it is so much more frequent from the age of fifteen to thirty-five, that this has been considered its proper season. This is the period when the energies of the system seem to converge towards the organs of respiration; and when are developed between them and distant organs those sympathies upon which their susceptibility to certain diseases would seem to depend. This is the period when phthisis strikes its victim; and when we come to speak more in detail of the particular lesions of the lungs which give rise to hæmoptysis, we shall see how often it occurs as a symptom of this disease.

Hæmoptysis sometimes comes on quite suddenly, and without any premonitory announcement. It is, however, in general preceded by chilliness of the skin, lassitude, alternating paleness and flushing of the face, headach, palpitation of the heart, and strong vibrating pulse. To these may be added what we may term the local symptoms, consisting of a painful sensation of weight and tension, and of heat and itching in all or in some part of the chest, with dyspnœa, and a sense of anxiety about the præcordia: these symptoms are due to the congestion which immediately precedes the effusion of blood. Other symptoms are enumerated, which are in reality owing to the blood already effused into the parenchyma of the organ, and into the bronchial tubes. Among these the most remarkable are a sense of ebullition in the chest, (a feeling produced by the mixture of blood and air from the successive movements of inspiration and expiration,) and a great increase of dyspnœa.

When blood is effused into the air-passages, the irritation it produces causes cough, which determines its expulsion; and when the effusion is considerable, (which it is sometimes, to the degree of producing an urgent sense of suffocation,) the muscles of expiration contract almost convulsively, the lungs are compressed, and the blood is expelled with violence through the mouth and nose. Sometimes some of it, passing into the stomach, excites vomiting and is rejected with the contents of this organ; a circumstance which may embarrass our diagnosis as to the original source of the hemorrhage.

Hæmoptysis varies considerably in the quantity of blood discharged. Its extent is sometimes so great that we wonder how it can take place, and not extinguish life; still we see the same quantity discharged again and again at intervals not very long distant, and this go on for months, nay for years, and the subject of it ultimately restored to the enjoyment of perfect health. At other times, we regard with alarm even the appearance of expectorated blood, when we have reason to look upon it as the index of deeper mischief latent; a single sputum tinged with blood will then bespeak more danger than a loss, frightful in quantity, under different circumstances. From this we may conclude that the extent of the hæmoptysis is not in all cases an exact measure of the amount of danger; and that in general its importance is derived from the circumstances under which it takes place.

We should be acquainted with the appearances presented by expectorated blood, as a circumstance to guide our diagnosis. When it is not in considerable quantity, it is generally frothy or mixed with air, and of a vermilion or arterial colour; if it be considerable, it is not frothy, but has the arterial colour. These appearances, however, are not sufficiently constant to enable us to rest our judgment on them alone; we must have recourse to other signs and symptoms, both positive and negative, before we deliver our opinion in doubtful cases.

Among the constitutional symptoms of hæmoptysis, some depend upon the actual loss of blood; others are due to the alarm or nervous shock produced by this phenomenon, which is so often associated with circumstances of danger. In this way alone can we explain the exanguious appearance, the tremour, the hurry of the circulation, the irregular action of the heart, the fainting which we find so often to follow the loss of even a moderate quantity of expectorated blood. We constantly observe a loss of blood apparently trifling produce more disturbance in a nervous delicate person, than a very considerable loss will do in one of a strong vigorous constitution: in fact, fright and hemorrhage have precisely the same physiological operation, and give rise to the same phenomena.

Hæmoptysis is the consequence either of congestion of the lungs, (whether caused by the blood thrown upon these organs with unusual force, or by its remora in them,) or of some lesion of those organs: we shall therefore consider it under these circumstances respectively.

When we reflect upon the organization of the lungs, we cannot wonder that they should often be the organ through which nature relieves herself from a state of morbid plethora; especially should that state depend upon the suppression of a hemorrhage which ordinarily takes place from an organ between which and the lungs a sympathy is known to exist. Physiology has ever recognised a remarkable sympathetic relation to exist between the organs of respiration and the uterine system; in virtue of which the lungs (especially when possessed of any particular susceptibility of disease whether natural or acquired) seldom remain long unaffected, should there be any interruption to the development or regularity of the functions of the uterus. This is the most fertile source of hæmoptysis, independent of organic lesion of the lungs. In some of these cases we find the hæmoptysis anticipating the period of the establishment of the menstrual discharge, and entirely ceasing when this discharge has been fully established. In other cases we find the hæmoptysis altogether superseding this discharge, usurping its regular periodical appearance, and establishing itself into a function, so connected with the health of the system as to require much caution to be observed in interfering with it. Again,—and which is the most common case,—the hæmoptysis is a supplementary discharge, making up for the deficiency of the menses: in these instances nature seems to make an effort to establish the due order of her functions; pains in the back and loins are felt at the same time as a sense of weight and tightness in the chest, with oppressed breathing; upon these follow a mere appearance of the menstrual discharge, and a more profuse discharge of blood from the chest. This state of things will sometimes continue till the period of life when the menses usually cease, with no more inconvenience than the occasional oppression caused by the congestion which precedes the hæmoptysis. Hoffmann mentions a remarkable case in which the hæmoptysis usurped the place of the menses: the subject of it became pregnant, the hæmoptysis was then suspended, and reappeared after delivery, and continued for many years.

Suppression of the hemorrhoidal discharge will give rise to hæmoptysis. Between this and the hæmoptysis connected with suppressed menses, Laennec makes the distinction that the former occurs as pulmonary apoplexy, and the latter as bronchial hemorrhage. This hemorrhage exhibits the same tendency to return as the discharge which it has superseded. Masson (*Dissertation sur l'Hémoptysie*) records a remarkable case where the hæmoptysis, which succeeded a suspended hemorrhoidal discharge, returned regularly every month for a year, although the original discharge had not observed the same periodical regularity.

Hæmoptysis occurs sometimes, though rarely, as a critical discharge. Nature, in directing her critical efforts to other organs in preference to the lungs, would seem as if she respected these organs in consideration of their importance, and of the danger that might result from their being the subject of hemorrhagic congestion.

Any circumstance, which, by interrupting the balance of the circulation, throws an unusual quantity of blood upon the lungs, may act as a cause of hæmoptysis. It is thus that the bent position of the body, which certain trades require, acts. Tailors are, for this reason, much subject to this affection: their constant sitting posture, with the body bent and head leaned forward, and with the abdominal viscera so compressed as to admit a less than natural quantity of blood into them, favours an unequal distribution of this fluid, which is directed in an undue proportion towards the lungs, and produces in them a local plethora, a frequent result of which is hæmoptysis.

Malformation of the thorax, by compressing the lungs, and thus interfering with the free exercise of their functions, often causes hæmoptysis; a fact already noticed by Morton.

Prolonged pressure upon the abdomen by tumours, whether solid, fluid, or gaseous, produces hæmoptysis, by diminishing the quantity of blood sent to this region, and increasing that which is carried to the chest. In advanced pregnancy hæmoptysis is sometimes so considerable as to demand instant delivery. Stoll mentions a case in which hæmoptysis came on during ascites: it ceased on tapping, and reappeared on the fluid accumulating again. Tympanitis has been known to be attended with a similar result.

Hæmoptysis is often caused by a paroxysm of some of the diseases classed under the head of *neuroses*. Bohn mentions a case of epilepsy, each attack of which brought on a profuse hæmoptysis. We have often had occasion to observe the same in paroxysms of hysteria.

M. Fougnet, Professor at Montpellier, treated successfully with bark a tertian which was always ushered in by an hæmoptysis so considerable that the patient seemed to vomit blood.

Low, asthenic fevers, accompanied with petechiæ, often exhibit this phenomenon. It was much more common in eruptive fevers before Sydenham improved the practice in this class of diseases. Haller observed, in an epidemic small-pox, that all who were treated upon the cordial heating plan were covered with livid spots, the appearance of which was preceded by pains in the back and chest, and by hæmoptysis. Diemerbroeck, in his description of the plague which ravaged Belgium and Germany in the middle of the seventeenth century, mentions the hemorrhagic flux from the nose, uterus, urinary passages, and lungs. Fracastorius makes the same observation respecting the plague of the fourteenth century.

Besides this accidental complication of fever and hemorrhage, authors admit a hemorrhagic fever, in which the fever is as essentially connected with the hemorrhage, as the fever preceding and accompanying small-pox is part of that disease. This fever may be either sthenic or asthenic in its type, and the accompanying hemorrhage either active or passive in its character. The most striking feature of sthenic hemorrhagic fever is the full, bounding, vibrating pulse, so characteristic of this morbid condition that by it alone we can almost predict an impending hemorrhage.

We have already anticipated our observations upon hæmoptysis resulting from congestion of the lungs, the effect of disease of the heart, and explained its frequency in that particular lesion which consists in a narrowing of the communication between the left auricle and ventricle. The following case will illustrate this point. We had under our care, for three years, a young female who laboured under most distressing palpitation, greatly increased by the slightest exertion or motion: the phenomena of auscultation left no doubt that the lesion consisted in a narrowing of the left auriculo-ventricular opening of the heart. She had repeated hæmoptysis, which became more frequent and profuse as she approached death. Examination of the body after death exhibited both lungs gorged with blood; even the minutest capillaries under the pleura were injected; and there were numerous ecchymosed patches in the cellular tissue subjacent to this membrane. The heart did not exceed the natural size; its right ventricle was both in a state of hypertrophy and dilatation; the left ventricle was smaller than natural; the capacity and muscular structure of the left auricle were unusually developed; the communication between the left auricle and ventricle would scarcely admit the introduction of a crow-quill. The pulmonary artery exceeded its natural size; the calibre of the aorta scarcely equalled that of the common carotid. This is the lesion which we shall find to be most frequently the cause of pulmonary apoplexy; a form of hemorrhage to which we shall have occasion to advert when we come to speak of the morbid conditions of the lungs which give rise to this phenomenon.

Hæmoptysis arises no less from moral than from physical causes. Moral causes operate principally in the production of hæmoptysis through the medium of the heart; in fact, the lungs and heart have such an intimate sympathetic relation, that one cannot be affected without involving the other; so that it is not always easy to determine which has preceded in the order of their derangement. There is no organ in the body more subject to disturbance of its function from the irregular play of passion than the heart; and whether that passion be of the exciting or depressing character, it is equally capable of producing hæmoptysis. These two orders of moral affections act upon the heart as stimulant and sedative agents do; the former throwing an unusual quantity of blood upon the lungs; the latter, by weakening the impelling power of the heart, giving rise to a stagnation of blood in them. In addition to hæmoptysis proceeding from these palpable causes, we sometimes meet with it under circumstances in which we cannot fathom its etiology; when, perhaps, it depends upon some particular state of the capillaries, which our imperfect knowledge of this portion of the vascular system prevents our appreciating. One of these mysterious cases is that remarked by Dr. Cheyne in the fifth volume of the Dublin Hospital Reports: the subject of it has had, since 1807, frequent attacks of hæmoptysis coming on at variable intervals, but nearer to each other in spring. We have had recent communication with this individual on the subject of his disease, and have been informed that it comes on without any provocation, and when at its height returns three or four times in the course of the day: it is not influenced either by rest or by exercise, and does not seem to yield to remedies, but subsides spontaneously. Previous to the attack a sense of constriction is felt in the chest; there is no fever, the pulse not exceeding eighty-four beats in the minute. A system of small bleedings from the arm, adopted at the suggestion of Dr. Cheyne, gave the first check to his disease, and by following it up he is now enabled to engage in the active duties of his profession as a clergyman, and feels no inconvenience from an unsparing exercise of his voice.

We now come to consider hæmoptysis in connection with actual lesion of the lungs.

Unquestionably the morbid condition of the lungs with which hæmoptysis is most frequently associated is the development of tubercles: this is a pathological fact universally admitted, though the question whether the hæmoptysis, which so often ushers in phthisis pulmonalis, be the harbinger of tubercles, or the index of their actual existence in the lungs, is still *sub judice*, each opinion reckoning among its advocates the highest pathological authorities. Laennec is of opinion that the formation of tubercles precedes the hæmoptysis, and that the contrary opinion is founded upon the hasty application of the axiom, *post hoc, ergo propter hoc;* that though the hæmoptysis is the first symptom of the disease which attracts notice, still, if the chest be examined before its appearance, there will be evidence of the existence of tubercles; and as hæmoptysis often recurs in the progress of the disease, we may conclude that the presence of tubercles is its most frequent occasional cause. He further adds that the mode of their operation in the production of this effect is easily understood, when we consider that they are foreign bodies, which in their development press upon and irritate the parenchyma of the organ; that, on the other hand, we want a positive fact to prove that hæmoptysis alone can produce tubercles; nor can we conceive, anatomically, how that can be the case; for if it were so, we should see hemorrhagic engorgement transformed into miliary tubercles, a circumstance which he had never observed. Besides, he observes, hæmoptysis resulting from violence is nothing more than a mere accident, unattended by any unpleasant sequelæ if properly treated; whereas tubercular phthisis, long latent, often manifests itself immediately after an hæmoptysis coming on without any appreciable cause, and which has no other cause than the presence of tubercles in the lungs.

Andral, in advocating the opinion of the hæmoptysis preceding the formation of tubercles, and being their actual cause, says he has more difficulty in conceiving how tubercles, which, according to those who espouse the former opinion, have the power of irritating the pulmonary parenchyma to the degree of producing abundant hæmoptysis, can exist for a long time without causing even a slight cough, than that under causes more or less appreciable some portions of the lungs should become the seat of sanguineous congestion, and give rise to hæmoptysis. If this congestion exist in one or more points of the lung, and if at the same time the subject be predisposed to tubercles, these bodies may arise easily, and multiply rapidly, in the midst of a part whose nutrition is modified in consequence of the new state in which it is: it is thus that he would explain phthisical symptoms so often following hæmoptysis, although well-directed treatment will often avert the mischief.

Louis thinks that hæmoptysis, unless connected with irregular menstruation, or dependent upon external violence, furnishes strong presumptive evidence in favour of the existence of tubercles in the lungs; an opinion sustained by actual observation and the analogy of other organs, in which, when hemorrhage occurs, it is the index of some serious alteration in their structure; besides, it is natural to suppose that the same cause which produces hæmoptysis in the progress of the disease, produced it also in the beginning.

We may infer that Broussais is of opinion that hæmoptysis precedes the formation of tubercles, from his observation that the loss of blood is not to be considered the direct cause of consumption, but as one of the inflammatory movements which are the sole cause of phthisis.

Amidst these conflicting opinions, we hesitate to express a decided judgment, while we admit a bias in favour of that which considers the formation of tubercles to precede the hæmoptysis. In the examination of those who have died of hæmoptysis, we have found tubercles, the existence of which was not suspected during life; and we have ever regarded the mode of operation of tubercles in the lungs to be precisely similar to that of foreign substances in other parts of the body, each tubercle or cluster of tubercles acting as a nucleus or centre of irritation, and soliciting to the part an unusual flow of blood.

In admitting the difficulty of deciding between these opposite opinions, it happens fortunately that the difference carries with it no practical inconvenience, as whichever view be adopted, it involves no difference of treatment. So frequent an accompaniment of phthisis is hæmoptysis, that Louis found it to exist in two-thirds of the cases which fell under his care.

Andral observed, that among those that die of consumption, a sixth have never spit blood; three-sixths or a half never spit blood till pulmonary tubercles had given unequivocal evidence of their existence; and in the remaining two-sixths the hæmoptysis seemed to precede and be the actual cause of the tubercles.

There are three principal sources from whence the blood expectorated in these cases may be derived; either from the mucous membrane of the bronchi, or from a tubercular cavity, or from the parenchyma of the lung. Death is sometimes caused by hæmoptysis, when examination can detect no other source of it than the bronchial mucous membrane, which, in this case, only exhibits a slight blush, or is even paler than natural. As hæmoptysis is found to be more frequent when tubercles are in their crude or nascent state, we may account for the repetition of this phenomenon by the successive development of these bodies through the course of the disease, on the physiological principle above noticed, *ubi stimulus ibi fluxus*. We may perhaps ascribe the frequency of hæmoptysis at this stage of the disease to the obstruction to the pulmonary circulation caused by the extensive tubercular development in the lungs; this obstruction demands an increased energy of the right ventricle, whereby the blood is thrown with unusual force into the lungs, and hemorrhage is thus produced. This we may expect to be most frequently the case when the tubercles have formed rapidly, and not allowed time for the heart to accommodate itself to this sudden encroachment upon the sphere of its operation; and it would be a more frequent occurrence if the strength of the heart were not weakened by this organ sharing in the muscular atrophy incidental to the disease.

The next source of hæmoptysis is a tubercular excavation. In several phthisical patients who have died of hæmoptysis, there have been found large excavations hollowed out in the lungs, and filled with blood either fluid or clotted: in this case the blood is also found in the bronchi and trachea, and the individual seems to have died of suffocation. It is very common to find the purulent matter contained in a cavity tinged with blood. It sometimes happens, though rarely, that the blood in these cavities is poured out from a vessel traversing their sides, in those transverse bands which Laennec has not unaptly compared to the carneæ columnæ of the heart: these bands consist of an artery, vein, and bronchial tube matted together. The canal of the artery is generally obstructed, although an unhealthy inflammation pervading the pulmonary tissue will interrupt this provision of nature; and the arterial structure, which might almost be said to enjoy an immunity from the effects of inflammation under its ordinary circumstances, will here yield, and admit of an extravasation of blood.

The next *reputed* source of hæmoptysis is the parenchyma of the lung. The lesion upon which this depends has, from its analogy with cerebral apoplexy, been designated pulmonary apoplexy. It is thought to depend upon a sanguineous exhalation into the pulmonary parenchyma, that is, into the air-cells, whose form is represented by the granular aspect of the surface of a section of a portion of lung affected with this modification of disease. This lesion, consisting of a circumscribed hardening of the pulmonary tissue, is considered by Laennec, who first noticed the subject, to be the frequent source of these alarming discharges of blood from the lungs which we sometimes meet with. The density of the affected portion of the lung is greater than that which constitutes hepatization. The hardened portion, different from that affected with hepatization, presents no trace of the pulmonary tissue, but is of a homogeneous aspect and of a deep black colour, resembling a clot of venous blood. Pulmonary apoplexy would seem to consist in a double lesion, viz. hemorrhagic engorgement and hæmoptysis: this latter, though the most striking feature of the disease, is less essential than the other, and may be absent without changing the character of the lesion. Experience has established this fact, auscultation recognising the engorgement which had not been announced by the ordinarily accompanying hæmoptysis. Nor indeed have we much difficulty in explaining this, if we revert to the observations we made upon the freedom of communication between the pulmonary and bronchial vessels. It is found to occur most commonly from hypertrophy of the right ventricle; the effect of which lesion is to throw the blood with unusual force into the capillary vessels of the pulmonary artery. Should that force be considerable, the blood will not only pass into the bronchial capillaries, and thus into the bronchial tubes, giving rise to hæmoptysis in the common form, but may lacerate not only the tissue of the lung, but also its investing membrane, and be extravasated into the cavity of the chest. We can likewise understand how the blood may be impelled with a force only sufficient to fill the capillaries of the pulmonary artery, without that force carrying it on to the bronchial capillaries; in which case we shall only have so much of the lesion as consists in the hemorrhagic engorgement without the hæmoptysis; whereas, should the influence of this force extend to the bronchial capillaries, ordinary hæmoptysis will be superadded. The external hemorrhage, then, we do not regard as a consequence of the hemorrhagic engorgement, but as a concurrent effect of the same cause.

There is a species of pulmonary apoplexy in which the extravasated blood forms a coagulum in a cavity hollowed out in the substance of the lung. This is the only lesion which in strictness seems entitled to the designation of pulmonary apoplexy, as being that which alone is analogous to the condition of the brain in the true apoplexy of this organ. In this lesion the pulmonary tissue is lacerated by the blood issuing from its vessels, in the same way as the cerebral tissue is lacerated under similar circumstances. A case of this nature fell under our notice not very long since; the subject of it died of a profuse expectoration of putrid blood; and on examination after death a considerable quantity of blood in the same state was found in a cavity occupying the entire extent of the right lung. The attack arose from exposure to cold when the individual was in a state of intoxication.

The modification of pulmonary disease which Bayle has designated *ulcerous phthisis* (phthisie ulcereuse), and which is now recognised as gangrene of the lungs, from the fetor of the breath and expectoration which accompanies it, often gives rise to hæmoptysis to such a degree as to cause death. Though this form of disease is sometimes, nay often, complicated with tubercular developments, the latter are not essential to it; it is, in fact, an unhealthy inflammation of the pulmonary parenchyma, which generally takes place in a bad habit of body, and in its destructive operation respects no tissue. This is the case in which nature seems to neglect her usual precautionary measure of obliterating the canal of the arteries, to provide against hemorrhage; these vessels remaining pervious, and giving way to the disorganizing ulceration, furnishes one of the few instances of hemorrhage arising from actual lesion of the containing canals. A profuse hæmoptysis is often one of the first symptoms that ushers in this disease; but in general the patient for some time previously has had a pain in the side, and a teasing irritating cough, his general health much deranged, languor and lassitude, loss of appetite, &c. Amidst these symptoms he is sometimes suddenly seized with hæmoptysis so extensive as to extinguish life at the moment; an instance of which is related by Bayle in the first case which he gives of this modification of disease. (Observation 25.) In some cases the hæmoptysis has the effect of relieving the system, as it were, from an oppressive load, and the patient feels himself much better after it; but fetid expectoration soon succeeds, and the hæmoptysis is repeated at variable intervals, but with the same feelings of momentary relief. This state of things sometimes continues through this often protracted form of disease. Examination after death exhibits the several tissues of the lung indiscriminately involved in one general sloughy mass emitting an intolerable fetor.

Hæmoptysis has no necessary connection with pneumonia; the prune-juice sputa, however, which Andral regards as characteristic of the third stage of pneumonia, owe their colour to the blood, which is mixed with the other matter of expectoration. Bronchitis, especially when it occurs as an epidemic, is sometimes attended with abundant hæmoptysis. This form of disease seems to differ much from ordinary bronchitis, and to bear some analogy to dysentery; for as this latter often degenerates into diarrhœa, so the former terminates in an analogous form of disease, consisting in a thin, frothy, abundant expectoration. When bronchitis thus occurs as an epidemic, it is accompanied with a small feeble pulse, great prostration of strength, loss of appetite, languor, lassitude, loaded tongue, and high-coloured urine, &c. It is of the last importance that we be acquainted with the form of disease, and be enabled to recognise the hæmoptysis as a symptom connected with and dependent upon a serious constitutional derangement, and whose treatment merges into that of the constitutional disorder. We have known death to follow a mode of treatment which only contemplated the hæmoptysis, and left out of sight the more important cause upon which it depended; this seems to be the disease which Stoll designated bilious hæmoptysis, and which he treated so successfully with emetics.

Independently of organic lesion of the lungs, hæmoptysis may arise from lesion of either the larynx or trachea, and is met with in persons whose profession requires a continued exercise of voice. Hæmoptysis, however, from this source has been admitted more from analogy than from actual observation, and seems to rest more upon negative than upon positive evidence; more upon the absence of the signs of pulmonary hæmorrhage, than upon any unequivocal proof that the blood comes from the larynx or trachea.

External injury often produces aggravated hæmoptysis; thus, violence directly applied to the chest will sometimes be followed by an immediate and abundant expectoration of blood, an effect which is often attributed to an opening of some vessel produced by a fractured bone, which is sometimes one of the consequences of this violence; but as in many cases the hæmoptysis comes on independently of any fractured bone, it must be ascribed to the commotion of the system produced by the violence. The assassin's poniard is the frequent source of fatal hæmoptysis. Henry the Fourth of France received two strokes of a knife from the hand of the traitor Ravaillac; he uttered a few words, threw up some blood, and immediately expired. Examination after death discovered two wounds: one, in the left side of the chest, did not penetrate; another, between the fifth and sixth ribs of the same side, penetrated the left lung, and made an opening to the pulmonary vein, capable of receiving the point of the little finger: the lungs were black and gorged with blood, and there was much blood effused into the cavity of the chest.

Treatment. — Having considered the important phenomenon of hæmoptysis under its different phases, and under the different circumstances both of the constitution and of the organs with which it is connected, we next come to the interesting subject of its treatment; upon which were we to enter as fully as its importance deserves, we should extend this article beyond its legitimate limits, and encroach upon other articles which have to deal with this phenomenon in the relation of a symptom of many morbid conditions both of the constitution and of the organs from whence the blood proceeds. To the several specific articles upon these morbid conditions we would refer for more detailed information upon this important subject, while our observations partake more of a general character. We have seen that hæmoptysis generally occurs either in consequence of congestion of the lungs, or of lesion of these organs: what we shall have to observe upon its treatment will contemplate it under these two modifications of circumstances.

Congestion of an organ so important as the lungs must ever be regarded with alarm, and for this reason Hoffmann observes that of all morbid hemorrhages hæmoptysis is that which is accompanied with most danger. Even when it is connected with suppression of some habitual discharge, and seems to make amends to the constitution for the derangement of its functions, it cannot with safety be permitted to continue, but must be met with an uncompromising hand.

The treatment of hæmoptysis resolves itself into that which is to be employed during an attack, and that which is to be pursued in the intervals of the attacks, with a view to prevent their return. The character of the hemorrhage, as to its active or passive nature, is the point upon which the treatment hinges. In an attack of active hæmoptysis, general bleeding, proportionate to the vascular orgasm and to the strength of the individual, must be employed, and leeches should be applied to the chest, or in the neighbourhood of the organ which is the usual vent of the hemorrhage upon whose suppression the hæmoptysis may depend. The auxiliaries to bleeding are derivatives or counter-irritants, either internal or external. The first include purgatives, emetics, sudorifics, and diuretics; in fact, all those medicines which, exhibited internally, produce a derivation to counterbalance the original hemorrhagic movements. The external counter-irritants consist of blisters, mustard cataplasms, frictions, rubefacients, &c. Among the internal derivatives, purgatives of the saline class hold a foremost place; while they determine to the mucous membrane of the intestinal canal, they reduce the mass of the circulating fluid. Emetics present the threefold advantage of causing a revulsion, of producing a sedative effect upon the heart, and of determining to the skin. Sudorifics and diuretics also produce a derivative effect (though in a milder degree) by their action upon organs different from that which is the source of the hemorrhage. Nitre, from its refrigerating properties, has been long regarded as a most valuable medicine in active hemorrhage: it has been reputed to produce an actual change in the inflammatory character of the blood. Digitalis and acetate of lead powerfully co-operate to restrain the violence of the heart's action by their sedative effect upon this organ. Muriate of soda is a popular remedy for hæmoptysis, and one whose efficacy we have often witnessed. Acidulated drinks are valuable adjuvants.

[In this country, it is very common, during the flow, for the patient to be directed to take common salt into his mouth, under the idea that it possesses hæmastatic virtues; but the writer, as he has remarked elsewhere (*Practice of Medicine*, 2d edit. i. 290, Philad. 1844,) has never had the slightest reason for believing that it has been productive of any advantage; nor can he see on what principle it has been recommended. After a time, longer or shorter, according to circumstances, the hemorrhage ceases, whether salt has been employed or not; and hence it has probably happened that the result has been ascribed to the salt, when it may have exerted no agency. By M. Andral (*Cours de Pathologie Interne*) it is referred to as a remedy employed in Philadelphia.

It is important, however, not to allow much fluid of any kind; but to allay thirst in active hæmoptysis, small pieces of ice may be taken into the mouth, or iced lemonade may be sucked through a rag.]

Much difference of opinion prevails as to the place where external counter-irritants may be applied with most advantage; some recommending the nearest point to the seat of the congestion as the fit place for their application; while others prefer a distant point, a preference to which we subscribe, both from reason and experience. The nervous agitation which generally accompanies hemorrhage suggests to us the absolute necessity of repose of both mind and body. There should be a free circulation of cool air around the patient, but not so cold as to cause constriction of the skin, and thus determine to the internal organs. The diet should be conducted upon the most rigid principle of abstinence from every thing capable of producing the least excitement of the system.

It will sometimes happen that the hemorrhage will reduce the powers of life so low that we shall be obliged to administer stimulants. The proper management of a patient under these circumstances is one of the nicest points in the practice of medicine, as we have to determine the extent to which we can safely employ stimulants without running the risk of exciting the system, and awakening the orgasm which has produced the effect which we seek to redress. In many of these cases there is no proportion between the loss of blood and the constitutional disturbance, the latter being much greater than can be accounted for by the actual hemorrhage, which is sometimes very inconsiderable: the nervous irritability of the individual can alone account for it: here we may advantageously employ antispasmodics, viz., camphor, ether, &c. to calm the flurry and agitation of the nervous system.

If the hæmoptysis *ab initio*, partake more of a passive character, we shall find our most valuable remedies to consist of the mineral acids, conserve of roses, infusion of roses acidulated with sulphuric acid, turpentine, muriated tincture of iron, [tannic acid, creasote,] &c., and sponging the chest with cold vinegar and water. To these cases much advantage is derived from blisters applied to the chest; they restore the tone of the capillary vessels, upon whose weak condition the hæmoptysis depends. A free circulation of refreshing air is no less beneficial in passive than in active hæmoptysis: we have known it to give an immediate check to this affection. We are not obliged to observe the same strictness in diet in this form of hæmoptysis, and may gradually come to that of a more nourishing character, with a moderate use of port wine and water.

We are next to consider the treatment and management of hæmoptysis in the interval of the attacks, with a view to prevent their recurrence. If we can connect the hæmoptysis with the suspension of an habitual hemorrhage, the obvious indication is to restore that hemorrhage. Should a suppression of the hemorrhoidal discharge be the cause, aloetic purgatives, and leeches applied *circa anum*, are the means to be employed. If the suspended menstrual discharge seem to be the cause of the hæmoptysis, we must endeavour, though with caution and without forcing the system, to restore the due order of the functions; and with this view we try to assist the abortive efforts of nature at the ordinary period of the menstrual discharge, by determining to the uterus by means of aloetic purgatives, by leeches applied to the interior of the thighs, and by the hip-bath: but our treatment will especially consist in imparting a degree of vigour and tone to the constitution, upon a deficiency of which this derangement of function often depends. In this case chalybeate tonics furnish us with a valuable resource: sea-bathing, horse exercise, &c. also assist the object we have in view. (See Amenorrhœa, Chlorosis, Emmenagogues.)

In some cases we meet with this morbid phenonon in a condition of the system precisely opposite to that which we have just described, and in which we have to adopt a mode of treatment and management as opposite. In this latter instance our object is to reduce the fulness and plethora of the system by medicine and diet.

Should the cause of the hæmoptysis be less obvious, the frequency of its association with phthisis, and its being so often the precursor of this fatal malady, must make us ever regard it with alarm. We before remarked that the adjustment of the question as to tubercles being the cause or consequence of hæmoptysis was a matter of indifference as regarded the treatment to be adopted to combat this affection; for, as Laennec has observed, it must be met by bleeding carried to the very limits of possibility. The question, however, assumes an aspect of greater importance when we come to consider the treatment suited to the intervals of the attacks of hæmoptysis: we then feel that it involves a consideration of the most vital moment, how far we can with safety pursue a depletory mode of practice, which may have the effect of indirectly generating tubercles, by producing a habit of body favourable to their development.

The formation of tubercles seems to us to be, in most cases, the result of a deteriorated constitution taking on an action *infra se.* We meet them either in persons imperfectly nourished, or in those who have been wasted by previous disease, as by long-protracted fever. We have observed in phthisical patients a disposition to generate worms and vermin, even in those who, to the latest moment of their existence, bestowed the utmost pains on the cleanliness of their person. The inference we deduce from this is, that these parasitical animals, like tubercles, indicate a degeneracy of habit, or, so to speak, a descending in the scale of the animal being. These points, however, more properly belong to the articles Tubercles and Phthisis, to which we refer for more detailed information upon them. We would only observe that the causes which call a tubercular diathesis into active operation are such as have the effect, either directly or indirectly, of debilitating the energies of the constitution; and that therefore, though hæmoptysis be a complication with which we cannot tamper, but which we must meet with decision, we cannot but regret the dilemma in which we are placed by a symptom requiring a mode of treatment which we have reason to apprehend may have the effect of increasing that condition of the system which has given rise to the original disease. We would convey our opinion respecting bleeding in phthisis in the words of Laennec, who observes that as bleeding can neither prevent the development of tubercles, nor cure them when they are formed, it should not be employed in the treatment of phthisis, except with a view to subdue an inflammatory complication or acute sanguineous congestion; beyond this it is a gratuitous waste of the patient's strength, and may be superseded by medicines, which have the effect of reducing the powers of the circulation without producing permanent prostration, such as digitalis, tartar-emetic, &c. We would here express our decided conviction that phthisis, of which hæmoptysis is so frequent a symptom, would be treated with much more success if physicians were not continually haunted with the apprehension of exciting or keeping up inflammation; a feeling which, within due limits, should ever be present, but still when pushed too far, and acted upon too rigorously, it deprives the system of its remaining stamina, and unfits it for bearing the exhausting effects of a wasting disease. A gentleman in Scotland (Dr. Stewart), who has now ceased to be a member of the medical profession, long since ventured to deviate from the routine of practice in this disease, and pursued a mode of treatment which has had most encouraging success: the principle of this treatment was to strengthen the constitution. He argued, that when the tubercles softened and the expectoration became purulent, the treatment should be the same as that required by the formation of matter in other parts of the body, when we have no other view than that of supporting the system. To fulfil this intention he treated the disease with tonic medicines cautiously exhibited, but placed his chief reliance upon cold bathing, exercise, and nourishing diet. His plan with respect to cold bathing consisted in making the patient sponge the entire body in the morning, and the neck, chest, and shoulders at night, with tepid vinegar and water, whose temperature was reduced each day till it was quite cold: this sponging was followed by rubbing for half an hour with flannels, and then with a flesh-brush. By degrees, as the feverishness subsided, the vinegar was laid aside. This was a preparation for cold bathing, and afterwards for sea-bathing. We do not mean to affirm that tubercles do not often form in an inflammatory habit, and that bleeding is not often required in such a habit: we only question its propriety as a preventive measure.

The slighter hæmoptysis, which comes on in the progress of consumption, seldom demands constitutional bleeding; it will in general be checked by acetate of lead, nitre, digitalis, conserve of roses, acidulated drinks, &c.

When the frequency of hæmoptysis in an individual not naturally predisposed to phthisis leads us to connect its cause with some obscure condition of the capillary vessels of the organ exhibiting itself in either active or passive hemorrhage, we have to treat it as an idiopathic disease, and not, as before, as a symptom whose treatment was modified by that of the disease upon which it depended. The character of the hemorrhage, whether active or passive, alone regulates our attention: we are, therefore, relieved from the caution with respect to bleeding which tied up our hands in the management of this morbid phenomenon in phthisis. It was this kind of habitual hæmoptysis to which we before alluded, as deriving so much benefit from small bleedings often repeated; a practice which seems to us entitled to a decided preference over large bleedings which cannot be repeated: for the efficacy of bleeding in these cases depends not so much upon the quantity of blood drawn, as upon the revulsive effect of the operation; the opening in the vein solicits the blood to it, and so diverts it from the source of the hæmoptysis. The older physicians appreciated this point of practice, and accomplished it by closing the opening during the operation. When we reflect how comparatively independent of the general circulation the capillary system is, we see reason to expect more advantage from means which have more of a local operation, as cupping, leeching the chest, &c. We shall find nothing to exercise such a salutary control over this kind of hæmoptysis as change of air, adapting the temperature to the character of the discharge; if it be active, removing to a warmer climate; if passive, to a colder and more bracing. This hemorrhage is much influenced by moral causes; moral management constitutes an important part of its treatment: the writer has known it to cease immediately upon hearing agreeable news.

Pulmonary apoplexy demands full depletion. Bleeding should be carried to the extent of producing fainting, and should the hæmoptysis still continue, we must adopt every other means calculated either directly or indirectly to lower the energies of the circulation. For this purpose we would employ small doses of ipecacuanha often repeated, so as to keep up a continual nausea. Purgatives are a valuable resource. Laennec has not found tartar-emetic as beneficial in this form of disease as in inflammation. Astringents should not anticipate the chronic stage of the disease.

Hæmoptysis dependent upon gangrene of the lungs requires a mode of treatment adapted to the vitiated constitution in which it occurs. Tonics constitute our principal remedial agents, while we seek to allay the irritation of the cough by opium, hyoscyamus, conium, &c. When hæmoptysis proceeds from the larynx or trachea, and seems to be produced by an excessive exercise of voice, the first thing required is the repose of the organ; nor, in general, is this enough; as the local affection is merely the index of constitutional relaxation, the object of the means we employ must be to restore the tone of the system by exercise, shower-baths, sulphate of quinine, &c. To this we would add sponging the throat with vinegar and water. For further information on this subject we would refer to the articles Apoplexy, Pulmonary; Phthisis Pulmonalis; Lungs, Gangrene of the, &c. &c.

Robert Law.

HEADACH.— *Cephalalgia*, from κεφαλὴ, the head, and ἄλγος, pain. From a very early period the term cephalalgia has been employed to designate various kinds and degrees of pain affecting the head. Some authors, indeed, have confined its use to headachs of the more obtuse and transient character; including pain of a more severe, tensive, and continued kind under the term *cephalæa.* But the words are too nearly alike ever to preserve a separate and distinctive meaning. For all practical purposes it will be more eligible to adopt exclusively the term cephalalgia, as answering to our English word headach, arranging under it the more marked distinctions of headach as species and varieties.

From the intimate connection which subsists between the sensorium and every other part of the system, it is not surprising that the head should participate in the morbid affections of those parts. Disorders of the stomach, liver, intestines, and uterus, especially, have long been observed to produce pains of the head. Nosologists have accordingly specified many kinds of *sympathetic* cephalalgia; but they have not been equally successful in pointing out the kinds of pain which arise from the diseases of the head itself. In truth, the difficulty of such an undertaking seems to have deterred them from making the attempt. They have too readily acquiesced in the opinion that, with the exception of some organic lesions of the brain, pain of the head almost always arose from morbid affections of other organs. Even the philosophic Cullen has given cephalalgia no place in his nosological system. Yet it would be truly astonishing if the head, itself so susceptible of impression from disorders of other parts of the system, should not suffer pain from some of its own. Many serious structural changes may indeed take place within the head unaccompanied by pain; but it is impossible to deny that numerous other morbid conditions of the brain and its meninges, as well as of the cranium and its coverings, do produce headachs of various and distinctive characters, and requiring a corresponding variety in the treatment.

One of the difficulties connected with the investigation of headach arises from the gradual and almost imperceptible conversion of pain, originally sympathetic, into an independent affection, which may remain long after the primary disease has been removed. Thus dyspeptic headachs not unfrequently induce permanent disorder in the head, remaining perhaps for months or years as the habitual malady, although the original symptoms of indigestion may have been entirely lost.

Another source of obscurity may be traced to the frequent coexistence of disease in the head and in some other organ with which the head peculiarly sympathizes; each disease serving to influence and aggravate the other. Under such circumstances it is sometimes difficult to determine which was the original malady.

Allied to this difficulty is a third, arising from the simultaneous operation of several of the more powerful exciting causes of headach; such, for example, as immoderate mental excitement and stimulating potations, both upon the head and upon the stomach. Thus, intense application of mind may not only excite headach by its direct action upon the brain, but may at the same time produce evident disorder of the digestive organs. Without careful discrimination, such a headach would probably be ascribed solely to dyspepsia, to the neglect of the actual state of the brain; whereas the derangement of both head and stomach may be alike dependent on the undue excitement of the sensorium.

In no disease, perhaps, does the subject of *predisposition* require to be more attentively considered than in cephalalgia. Of the circumstances which especially predispose to headach we may enumerate the following:—

1. Original malformation of the head. 2. A highly susceptible state of the nervous system. 3. Debility, however induced. 4. General or local plethora. 5. The previous occurrence of congestive or inflammatory disease. 6. Habitual or frequent excess in wine, spirits, and other powerful stimulants. 7. Injuries of the head from blows, falls, &c. 8. Continued mental excitement.

The occasional or *exciting causes* of headach are very numerous. Some of them would produce the disease in almost any individual, even under ordinary circumstances; but the greater number only excite pain of head in persons already predisposed to the malady. Hence the great importance of estimating the degree of predisposition. Of the more frequent occasional causes we may specify: —

1. Rheumatic affection of the pericranium. 2. Inflammation, or a more chronic morbid condition, of the pericranium. 3. Inflammation of the mucous lining of the frontal sinuses, or foreign bodies within the sinuses. 4. Intense mental excitement. 5. Strong impressions on the external senses. 6. Excessive impetus of blood to the head. 7. Impeded return of blood from the head. 8. Congestion within the head. 9. Suppression of accustomed evacuations. 10. Inflammation of he brain or its membranes. 11. Tumours, or other morbid changes of structure within the head. 12. Morbid affections of the stomach: — as from over-excitation or distension; from irritating ingesta; from imperfect digestion; the presence of bile in the stomach, &c. 13. Costiveness. 14. Narcotics. 15. Worms. 16. Diminished pressure of the atmosphere. 17. A heated, humid, or deteriorated atmosphere. 18. Sudden changes of temperature. 19. Exposure to a current of air, or to a cold wind, especially from the east.

This enumeration will sufficiently show the impossibility of treating separately every variety of headach in a work like the present. Some leading distinctions of cephalalgia can alone be attempted; and such, we apprehend, may be satisfactorily comprised in the following species: —

1. Cephalalgia muscularis.
2. ——— periosteosa.
3. ——— congestiva.
4. ——— organica.
5. ——— dyspeptica.
6. ——— periodica.

Of these we shall now proceed to treat separately.

I. **Cephalalgia Muscularis.** — This kind of pain is essentially of a rheumatic character, and particularly affects the occipito-frontalis and temporal muscles. The pain is tensive and remitting, sometimes diffused over the greater part of the head; at other times, varying its situation from the forehead to the vertex or the occiput, or from one side of the head to the other. In some cases, also, the pain extends to the face and teeth. Not unfrequently, the muscles of the neck and shoulders are at the same time affected with fugitive pains. The action of the affected muscles remarkably increases the pain and tension, as does also even slight pressure upon the scalp. The attack may be usually traced to some partial exposure to cold or humidity, as by sitting near an open window, or standing in a current of air after being heated by exercise. It is often preceded by a sense of coldness over the head and along the sides of the face. Some disturbance of stomach usually attends it for the first day or two, accompanied sometimes with slight febrile excitement of the system. These symptoms generally soon subside, even without medical treatment; leaving, however, an increased susceptibility in the parts to a renewal of the complaint from very slight causes. A dose of calomel and antimony, aided by a pediluvium, at night, and followed by a brisk aperient dose in the morning, considerably expedites the departure of the pain. In some cases of peculiar severity, diaphoretic remedies are required; and if the pain be very acute, leeches to the temples will afford considerable mitigation. But the principal aim of the practitioner should be to prevent a recurrence of the attack, by directing the patient to be much in the open air; to use a shower-bath daily, or, in its stead, the free affusion of cold water over the head; and every other practicable method of restoring the tone of the affected parts, and thus enabling them to resist the influence of cold and humidity.

II. **Cephalalgia Periosteosa.** — This is an unusual form of headach, and has not, we believe, been hitherto described by authors. The writer of this article first pointed out its nature in a paper read before the Westminster Medical Society in the year 1825. In many particulars, the periosteal headach resembles the muscular. As in that species of cephalalgia, the pain is diffused, tensive, and remitting, increased by pressure and by the action of the occipito-frontalis and temporal muscles. It may also be generally traced to the same exciting causes, humidity and sudden changes of temperature. The very parts affected in the merely muscular headach are equally involved in this; but, in addition, the periosteum is also affected, and the sensorium suffers more excitement. The pain itself is more deeply seated and intense, and is attended with an augmented action of the external arteries of the head, as well as with more gastric and general febrile disturbance. The attack, moreover, does not so speedily subside; for although after a few days the muscular covering of the head can be moved without pain, and *slight* pressure no longer produces uneasiness, yet the periosteal pain and tenderness remain. *Firm* and deep pressure is still painful, and excites a sensation of distressing tension over the greater part of the head and face. The same kind of constrictive pain is produced almost invariably by going out of a warm into a cold room, or by taking off the usual covering of the head. The whole periosteum, indeed, of both the head proper and the face is implicated in the disease, although those parts of the membrane suffer most which are but slightly covered. Hence, the upper portion of the nose and the alveolar processes are particularly affected. We may here remark, as a striking proof of the periosteum itself being the immediate seat of the malady, that the pain is frequently transferred for a time from the head to the face, soon, however, returning to its more accustomed seat around the head. It is not less remarkable that an increased feeling of tension may be induced over the whole or the greater part of the head and face by firm pressure upon any one point of the periosteum, whether of the head or of the face. Hence we may conclude that the structure affected is one common to both head and face.

It may, perhaps, be supposed that the periosteal cephalalgia now described is only an aggravated form of rheumatic headach. It is, however, a far more complicated and intractable malady, and occurs, we believe, only to those who have previously suffered from continued cerebral excitement. In truth, a two-fold predisposition appears to be essential to its production: — first, a highly susceptible, if not also preternaturally vascular condition of the brain or its membranes, such as is often induced by long-continued study, or high mental excitement, as well as by the frequent occurrence of sympathetic headach arising from gastric or hepatic disorder: and secondly, a state of debility and exhaustion supervening upon that excited condition of head, whether occurring spontaneously, or as the result of the depletory measures employed for the removal of the previous cerebral excitement. If an individual, under these concurring circumstances, be exposed to a powerful exciting cause, such as a sudden diminution of temperature, especially if accompanied by humidity, he may have the periosteal cephalalgia induced, — a disease of a singularly obstinate character, and apparently maintained by that condition of the brain or its membranes, which existed prior to the supervention of the external malady. On the other hand, the pain and irritation connected with the external malady tends, in its turn, to perpetuate the morbidly excitable state of the brain. The following case may serve as an illustration.

A gentleman of a susceptible constitution, who had long been subject to occasional attacks of dyspeptic headach, and had frequently suffered from mental application during a long and laborious course of study, was thrown at once into the onerous duties of a large public institution. Much pain and excitement of head ensued. General and local bleeding, mercurial purgatives, antimony, low diet, &c., were considered necessary. The symptoms subsided considerably, but the brain and nervous system remained in a state of extreme susceptibility. On some recurrence of pain, it was judged needful to shave the head, which happened to be done under circumstances of great exhaustion on a cold wet evening. The ordinary covering of a thin night-cap was alone worn during the night. On awaking from sleep, a severe constrictive pain was felt over the whole head, attended with heat and tenderness of the scalp, throbbing of the temporal arteries, considerable cerebral excitement, and vomiting. In truth, an external periosteal disease was thus engrafted upon a head previously suffering from high and continued excitement. After a few days, the more superficial tenderness subsided, but the periosteal affection proved exceedingly intractable. In this case it seems probable that the frequent occurrence of sympathetic headach, aided by the excitement attendant on long-continued study, had induced an undue degree of vascularity and of nervous susceptibility in the head generally; while the remarkable prostration of vital power consequent upon the depletory measures employed, served to increase the nervous susceptibility, and thus concurred to form that two-fold predisposition of which we have before spoken, and without which, we apprehend, the subsequent exposure to cold and humidity would have been insufficient to excite this peculiar periosteal cephalalgia, although it might have produced an ordinary rheumatic affection of the scalp. So exquisitely sensitive does the pericranium remain in these cases, so readily affected by every exposure to humidity or sudden reduction of temperature, and so apt to participate in every occasional excitement of the brain, that one attack of the complaint has scarcely time to subside before some fresh exposure gives rise to a decided augmentation of disease.

In the treatment of periosteal headach the first object must be to lessen the general cerebral excitement, as well as the inflammatory tendency and morbid sensitiveness of the affected membrane. Local bleeding, mercurial purgatives, antimonials, the acetate or citrate of ammonia, and similar means, are best adapted to fulfil these indications. Opiates are of doubtful efficacy. Should much nausea occur at the commencement of the attack, an emetic would be advisable; after which a dose of calomel and antimony, followed by a saline purgative, will generally be found very advantageous. The utmost quietude of mind should be preserved.

After the acute symptoms have been subdued, vigilant attention will be necessary to guard against a relapse. The susceptibility of the pericranium may be moderated by the gradual use of cold washing, followed by gentle friction of the head, as well as by a free though prudent exposure to the open air in the way of carriage, horse, and walking exercise. A residence in a dry and somewhat elevated situation will materially conduce to the patient's recovery. But it must also be remembered that the morbid condition of the membrane may be maintained by undue cerebral excitement, and that therefore the discipline of the mind, the avoidance of intense or long-continued study, and every engagement and pursuit which may tend to perpetuate that excitement, are absolutely essential to a permanent cure.

Under the division of periosteal headach it may be proper to describe that affection of the pericranium which has been called by Mr. Crampton *periostitis*. (Dublin Hospital Reports, vol. i.) Cases in some respects similar had been previously published by Sir Everard Home, (Trans. of the Soc. for the Improvement of Med. and Chir. Knowledge, vol. iii.) and some important illustrations of the same subject have been recently added by that accurate and distinguished pathologist, Dr. Abercrombie. (On Diseases of the Brain and Spinal Chord.) Fixed pain of the head and tenderness of some portion of the scalp, with a degree of thickening and swelling of the integuments, were the characteristic symptoms. The periosteum was generally found thickened, and, in some cases, the bone itself diseased. In the majority of instances, some affection of the brain coexisted with the periosteal disease. It would seem probable, however, that the periosteum was primarily affected in several of the cases adduced; in those, particularly, in which complete and permanent relief followed the division of the pericranium and the keeping open of the wound for a considerable time. Yet it must be allowed that even pains of head, apparently connected with internal as well as external disease, have been essentially relieved by such an operation. Mr. Brodie and the late Mr. Pearson have repeatedly cut down to the bone in cases of fixed and obstinate pain confined to a limited part of the head, maintaining afterwards a free discharge from the part, and with very decided success.

We might here without impropriety have introduced another kind of headach—that depending on a diseased state of the bones of the cranium, and attended with constant pain and tenderness at some particular spot; but as such cases are comparatively rare, we are unwilling to present it as a distinct species.

III. **Cephalalgia Congestiva.**—This species is characterized by an obtuse pain affecting the whole or a part of the head, particularly the forehead and occiput, and is frequently attended with a feeling of general oppression and torpor. It may be observed in three different states of constitution:—in the plethoric; in the delicate and irritable; and in the weak and leucophlegmatic.

1. The congestive headach frequently attacks persons of a *plethoric* habit, who have passed the middle period of life, have lived freely, and have used but little bodily exercise. In such the countenance is often bloated, the eyes are full and red, the veins of the face distended, and the general expression dull and inanimate. It is more especially observed in those who have suffered from gout or from chronic diseases of the liver, and after the cessation of the catamenia. In such it must always be regarded with vigilant attention, as indicative of an apoplectic or paralytic tendency.

2. The congestive cephalalgia also affects the *delicate and irritable*, especially those whose minds have been injudiciously cultivated at the expense of their bodily health and vigour. Hence it is most frequently observed in the female sex. In persons of this temperament the sanguineous circulation is so nicely balanced as to be disturbed on very slight occasions. A vivid emotion of mind, earnest or continued conversation, an unusual degree of bodily exercise, or some irregularity in diet or in the action of the bowels, will occasion in such habits an increased impetus of blood to the head, which, though only producing at the time a sense of heat and excitement, is generally followed by coldness of the legs and feet, and by the dull, oppressive headach of which we are now treating. In some cases the pain is attended with flashes of light or with little floating specks before the eyes, as well as by noises in the ears. This species of headach is particularly observable in delicate females of an irritable temperament, both before and for a day or two after each menstrual period.

3. The congestive headach also attacks the *weak and leucophlegmatic*. It may be recognised in persons who have been reduced by acute diseases, by hemorrhages, leucorrhœa, &c. It is also seen in chlorosis and in various other asthenic conditions of the system. There is usually a slow and languid pulse, a pale, sallow, or even semi-transparent appearance of the skin, and a peculiarly heavy expression of countenance. The lips are generally pale, or of a slightly blue tint; the feet are apt to swell in hot weather or after exercise; and every muscular exertion becomes laborious and formidable. In this variety of congestive headach, the pain is most commonly in the forehead, although in some cases the occiput is chiefly affected.

The *treatment* of congestive cephalalgia must necessarily be adapted to the circumstances of each individual case. We may remark that, in the first variety, that which is incident to the plethoric habit, venesection or cupping, brisk purgatives, a moderate diet, the affusion of cold water upon the head, and stimulating pediluvia, are usually required. When the attack has been subdued, the patient should be directed to avoid much mental application; to observe regular habits of exercise in the open air, as well as great moderation in diet, and a careful attention to the state of the bowels. The shower-bath should also be daily employed.

In the congestive headach of the weak and irritable, it may be sometimes necessary to have recourse to topical bleeding: but, generally quietude of mind, a stomachic aperient, the application of cold to the head, either by the affusion of water or by evaporating lotions, stimulating pediluvia, and the exhibition of camphor and ammonia or other diffusible stimulants, will prove adequate to the removal of the attack. Every precaution should be used to prevent a recurrence of the complaint by increasing the tone of the system, and thus counteracting the undue susceptibility of impression and the irregular distribution of blood, with which the malady is peculiarly connected.

The third variety of congestive headach, that occurring in the weak and leucophlegmatic, requires nearly the same management as the last. In this, however, the loss of blood can scarcely ever be necessary, although blisters are sometimes indicated. Warm and cordial aperients, the moderate use of wine, camphor, valerian, or ammonia, aided by a mustard or other stimulating bath for the feet, are well adapted to remove the immediate pain; while good air, gentle exercise, a nutritive diet, cheerful society, with the assistance of tonic remedies, more particularly the lighter preparations of steel, are not less calculated to invigorate the constitution, and thus preserve it from future attacks of the complaint.

We now proceed to a very important division of our subject, viz. headach arising from organic disease within the cranium: this we have ventured to name, although the term is not unexceptionable.

IV. *Cephalalgia Organica.*—So numerous and complicated are those morbid changes of the brain and its membranes which have been found to produce headach, that we must content ourselves with a reference to the most frequent of them; endeavouring chiefly to point out the principal symptoms which distinguish the organic headach from cephalalgia arising from other causes. Among the structural changes productive of headach, tumours are undoubtedly the most frequent. These may be either imbedded in the substance of the brain, or attached to its surface, or to the membranes surrounding it. Such tumours may be of a pulpy, adipose, albuminous, cartilaginous, scirrhous, or even bony consistence. Hydatids are another cause of headach, as are also spiculæ of bone attached to the dura mater, or growing from the inner table of the skull. In a case which occurred to the writer a few weeks ago, one of the clinoid processes of the sphenoid bone was found unusually long and formed into a thorny point, so sharp and strong as to pierce the finger when pressed against it. A similar, though not equally long point, was found to have grown from the squamous portion of the temporal bone. In some instances the membranes of the brain have been found thickened and partially disorganized; in others a portion of the brain has exhibited a softening or degeneration of its structure, or one or more abscesses imbedded within its substance.

In many of these diseased conditions, the pain of head may remain, during a considerable period, unattended by any other prominent symptoms: at length, however, some decisive indication of inflammatory action or of cerebral pressure occurs; the sight or hearing, for example, becomes affected, or the powers of the mind become enfeebled, or simple convulsion, epilepsy, or paralysis announces the extension of disease.

The diagnosis of cephalalgia organica is often difficult at an early period, while the pain is unattended by any morbid affection of the senses or of the moving powers. In general, however, we may remark that the pain itself is more fixed, deep-seated, and habitual than in other kinds of headach; more independent of the state of the stomach; more obviously increased by mental application, by close or heated rooms, by stooping, and sometimes even by the horizontal posture. The same degree of cheerful conversation which would chase away, or at least suspend the feeling of ordinary headach, often becomes laborious and almost insupportable in organic cephalalgia. Nor is the effect of stimulants received into the stomach less remarkable. Wine and other fermented liquors produce an immediate aggravation of pain. When the disease has considerably advanced, even a slight motion of the head will sometimes give rise to extreme suffering, and also to vomiting. It is proper to add that the disturbance of stomach which is sometimes present in this species of headach may occur without any apparent disorder of the stomach itself, and in this respect, as well as in others, differs materially from the sickness incident to dyspeptic headach. Moreover, the pain in organic cephalalgia equally remains when the sickness ceases. We have said that the pain in organic headach is fixed and habitual. There are, however, exceptions to this general rule. Sometimes the pain is of an intermitting character, although serious structural mischief may be steadily advancing. In such cases, the most vigilant attention to the collateral symptoms will be required before the real nature of the case can with any reasonable probability be determined.

V. **Cephalalgia Dyspeptica.**—This may be regarded as the most frequent kind of headach. In many individuals it is induced by very slight errors in diet, or even by remaining somewhat longer than usual without food. It may occur without any remarkable or at least very obvious degree of susceptibility in the brain. We see it, for example, in persons who can bear close application to study without any apparent inconvenience to the head itself, while yet very liable to headach from taking certain articles of food, or mingling them in too great a variety. Yet, in the majority of instances, it must be allowed that dyspeptic headach is most frequently found in those persons who also suffer from much mental excitement, and in whom the gastric disturbance is only one effect of that excitement. In such, the stomach may become either morbidly irritable or in the opposite state of atony, being, in either case, equally unfit for the due performance of the digestive functions, and therefore liable to be still further deranged by any irregularities in diet. The dyspeptic or *stomach* headach, when severe, more particularly affects the left temple, extending sometimes over the same side of the forehead, and producing tenderness in the corresponding ball of the eye. In other instances, the whole forehead, or even the greater part of the head, becomes painful. The pain may be either dull and oppressive, or of a more acute character, and in both cases renders mental exertion difficult and irksome. It is not unfrequently attended with some tenderness of the scalp, and an increased pulsation of the temporal arteries. The paroxysm of dyspeptic cephalalgia usually commences when the patient first awakes in the morning from a heavy sleep. The pain, at first diffused and oppressive, gradually concentrates itself upon one or other temple, generally the left, and becomes more and more acute. A degree of nausea often supervenes, sometimes increasing to sickness and vomiting. If the latter occur, the remains of an undigested meal, or merely an insipid fluid mixed with frothy mucus, is perhaps first ejected; but if the action of vomiting continue long, some admixture of bile usually follows. In some instances the stomach throws off, on the first attempt, green or yellow bile, or a fluid extremely acid and irritating; in which case, the pain of head is sometimes immediately relieved.

If neither vomiting nor aperient medicine be employed to check the ordinary progress of the paroxysm, the pain generally becomes more severe as the day advances, until it is lost in sleep. Occasionally, it remains during the greater part of the second day. When, however, an active dose of purgative medicine has been taken, the headach often becomes less in two or three hours, and ceases altogether in six or eight. It is remarkable that the beneficial effect of a stomachic and antacid purgative is frequently felt long before the offending matters are expelled from the bowels, clearly indicating that the sources of irritation were either in the stomach itself, or in the upper portion of the intestines.

Such is the usual course of a sick headach when occurring as a distinct paroxysm. The dyspeptic cephalalgia may, however, exist in a more chronic and habitual form, and in every possible degree. It may also be very transient in its duration. Many individuals suffer more or less inconvenience after every principal meal, unless they limit themselves, with the utmost prudence, in respect to the kind and quantity of food; but after two or three hours, the pain of head spontaneously ceases. When the stomach itself suffers from irritating ingesta, drowsiness or headach rather quickly succeeds, attended sometimes with confusion of thought and dimness of sight. In such cases, a mild emetic affords immediate relief. In many instances, however, the pain is not felt until several hours have elapsed, and is then accompanied with a sense of tightness and distension of the scalp and stiffness of the eye-balls. Sometimes the patient sees a mist before his eyes, or even luminous and coloured appearances, before the headach comes on. Under these circumstances, there is reason to believe that the *duodenum* is principally irritated; an opinion which is rendered probable by the sense of distension and uneasiness which is often felt in the exact situation of that bowel. It is sometimes, indeed, fully confirmed by the fact that an emetic under such circumstances does not afford relief, nor even evacuate any thing material from the stomach; while, on the contrary, a dose of magnesia, either alone or combined with rhubarb or epsom salt, will in two or three hours relieve both the headach and the uneasiness existing along the course of the duodenum. Yet it is proper to add, that when the irritating cause is considerable, both the stomach and duodenum remain in a state of disturbance during several hours.

In a very able paper on headach, inserted in the fourth volume of the Medical Transactions of the Royal College of Physicians, Dr. Warren maintains that the headach arising from irritation of stomach differs considerably from that which is produced by disturbance in the duodenum; that the former "is attended more with confusion than pain," while the latter is characterized by a dull aching of some parts of the head, "coldness and tightness of the scalp, slight giddiness, weight, pain, distension and stiffness of the eye-balls," and sometimes temporary numbness and tingling of the fingers and hand. Although feeling the greatest confidence in Dr. Warren's accuracy of observation, we have not been able satisfactorily to determine that the latter symptoms may not also occur from irritation of the stomach itself as well as of the duodenum; nor are we convinced that the duodenum can be irritated to such an extent, by matters which have lately been propelled from the stomach, as to produce a high degree of cephalic irritation, without its contiguous organ, the stomach, being at the same time somewhat implicated in the disturbance.

The exciting or immediate causes of dyspeptic cephalalgia are sufficiently obvious: long fasting; excess in wine or other powerful stimulants; or in the quantity, quality, or variety of solid food, are among the principal. Particular articles of food, likewise, which are innoxious to most persons, become irritating to certain individuals. But it must not be forgotten that the efficiency of the exciting cause bears an important relation to the amount of predisposition; an article of food, for example, may produce headach to-day, if the stomach or the brain, or both, be unusually excitable, which would not have produced it yesterday when those organs were less susceptible of irritation. Hence the importance of particular investigation with respect to the previous state of the head, as well as of the digestive organs. In many instances it will be found that sedentary habits, excessive mental application, anxiety, the hurry of business, and similar causes, have gradually induced a strong predisposition to headach, although the tendency may not have been developed until some error in diet, acting as the exciting cause, gave rise to gastric disturbance, and thence to sympathetic pain in the head. In truth, a two-fold predisposition may be often said to exist, involving both the head and the stomach. In some cases mental excitement would seem to precede the morbid affection of the stomach. In persons of great susceptibility, a very high degree of cerebral excitation appears to be inconsistent with an adequate supply of nervous energy to the digestive organs; as if there were but a certain portion of vigour to be shared by the different parts of the system, and, consequently, that an undue proportion allotted to one occasioned a corresponding deficiency in the rest. The fact, however, is incontrovertible, that in many susceptible individuals, intense engagement of mind induces a powerless state of stomach and duodenum, giving rise to dyspepsia and the headach arising from it.

Not uncommonly cerebral excitement occasions a rapid and profuse secretion of bile, which, in its turn, produces a sick or bilious headach in its severest form. We have repeatedly seen the same effect follow an unusual degree of bodily exercise; in which case, it is sometimes attended with both vomiting and purging of a highly bilious character.

The dyspeptic cephalalgia chiefly occurs in early or in middle life, becoming less and less severe as the irritability of the system gradually declines. Sometimes, however, as life advances, there is an apparent transfer of irritability from the stomach to the bowels. Frequent diarrhœa takes the place of bilious headach, being excited by the same circumstances.

The treatment of dyspeptic headach requires a careful adaptation to the peculiarities of each case. An ordinary paroxysm of the pain, if attended with much nausea, may be considerably shortened by an ipecacuanha emetic, afterwards allowing to the stomach and to the head an interval of entire repose. After an hour or two, twenty or thirty grains of magnesia combined with rhubarb, or the sulphate of magnesia and an aromatic, may be given, and followed, after some hours, by a little bland farinaceous nourishment. Where no particular nausea is felt, the antacid aperient may be given at the first. A few grains of the subcarbonate of ammonia, or thirty or forty minims of the aromatic spirit of ammonia may be added with advantage, when the stomach is peculiarly irritable.

In the milder and more chronic forms of dyspeptic headach, much will depend on the discipline of the mind and the regulation of the table. Every individual may be able, by proper attention, to ascertain what kinds of food and what quantity of food he can comfortably digest; and under what particular circumstances the symptoms of indigestion and headach have generally arisen.

A little observation will also discover the connection which subsists between that state of tone and vigour of the whole system which regular bodily exercise induces, and the power of the stomach itself. Thus it will be found that the same kinds and quantity of food which perfectly agree while the individual takes his daily walk in the open air, and employs his brain within moderate bounds, become sources of indigestion and headach when the head is allowed too much duty and the feet too little.

The daily management of the bowels is an object of great importance in this kind of headach. When diet and exercise prove insufficient to secure a daily motion, a mild stomachic aperient, combined, perhaps, with an alkali, may be given every night, or on alternate nights, until the tendency to constipation and headach be overcome. When, however, there appears to be much *duodenal* indigestion, a few grains of rhubarb, or a grain or two of aloes, taken before dinner, will be a preferable mode of increasing the propulsatory power of the intestines. We cannot, however, recommend this as a general mode of regulating the bowels; being convinced that it often accelerates, in an injurious degree, the peristaltic action, and deprives the system of a part of the nourishment which would otherwise be received by absorption. Persons have been found to become manifestly thinner under such a plan. When, as indeed often happens, the biliary secretion is irregular or defective, a mild mercurial preparation may be given for a few successive or alternate nights. Occasionally some aromatic bitter, either with or without soda or ammonia, may be employed with advantage. Horse-exercise, if it be not used to the exclusion of walking, is often extremely beneficial. The shower-bath, or cold sponging, aided by friction of the skin and moderately warm clothing, are also powerful auxiliaries.

VI. *Cephalalgia Periodica.*—This kind of headach is said to be sometimes hereditary. It may have regular or irregular accessions, and may occur in a quotidian, tertian, or quartan form. It has returned periodically at the regular intervals of several weeks or even months. Most commonly it observes daily accessions, returning either in the morning or at noon. Sometimes a very limited portion of the head, a small spot, is alone affected. Not unfrequently the pain commences at the inner angle of the orbit, producing pain, redness, and tenderness of the eye, and extending towards the nose. This has been popularly called *megrim.* In other instances, one entire half of the head and face is affected, constituting the *hemicrania* of authors. The pain is sometimes so acute as to resemble that of tic douloureux; but it may generally be distinguished from the latter by its more regular periodical accessions, by the longer duration of each paroxysm, and by the more complete and protracted intermissions. In many cases, too, the periodic cephalalgia is obviously connected with existing rheumatism or catarrh. The pain of tic douloureux, on the other hand, is generally very sudden in its attack, and quite excruciating in its degree, but lasts only for a few seconds. It returns at indefinite periods, being readily excited by the slightest exposure to a current of air, or by the motion of the jaws in eating or speaking. The cephalalgia periodica also bears some resemblance to the muscular or simply rheumatic headach; from which, however, it may generally be distinguished by the greater regularity of its accessions; by its usually affecting a circumscribed portion, or, at most, one side of the head and face; and more particularly, by its frequent connection with intermittent fever. Sometimes, indeed, it appears to be the direct effect of an exposure to malaria, although unattended with the ordinary phenomena of fever. In other instances, a carious tooth or some lesion of the antrum highmorianum has appeared to produce and maintain the disease. Accordingly, the extraction of the afflicted tooth has entirely removed the cephalalgia.

As in every other species of headach, a careful consideration of the peculiarities of each individual case can alone lead to a discriminating and successful treatment. Where no local irritation can be traced, and no congestive symptoms about the head appear, cinchona in substance, or the sulphate of quinine, may be exhibited in the intervals, as soon as the bowels have been thoroughly cleansed by a dose of calomel conjoined with rhubarb, jalap, or some other effective purgative. In some peculiarly obstinate cases, it may be right to have recourse to the arsenical solution, preserving, at the same time, a regular state of bowels by some mild aperient, in combination with the pilula hydrargyri or the compound pill of the submuriate of mercury. Where the paroxysms are extremely violent, much relief may be often gained by a full opiate conjoined with the compound spirit of sulphuric ether, given just before the expected accession. In the more limited forms of the periodical cephalalgia, the extracts of belladonna and opium, applied to the part affected, sometimes afford considerable mitigation.

[In all the forms of nervous headach, immediate relief is often afforded by the application of strong counter-irritant lotions to the forehead and temples. For various forms of application, and especially for those of Granville and Raspail, the reader is referred to the article COUNTER-IRRITATION.

In one of the most severe cases of hemicrania that ever fell under the writer's attention, and which, (under the idea that encephalic hyperæmia existed,) had been treated by bloodletting on each attack, so that the patient, a female, was compelled to be bled once or twice a month, and when the writer first saw her, was highly anæmic and impressible, subcarbonate of iron, given in large doses, (℈i.—℈ii. three times a day,) entirely restored her to her family, to which she had been wholly unable to attend for months previously. Since that time—many years ago—she has had no attack.]

T. H. BURDER.

HEART, (DISEASES OF THE)—Diseases of the heart were, until recently, supposed severally to present symptoms of very much the same general character, and therefore to constitute a class of maladies which possessed considerable unity in their intrinsic nature. They are now, however, found to consist of a variety of distinct affections producing very different and sometimes opposite symptoms. Thus, hypertrophy produces increased, and dilatation diminished force of the circulation. In order, therefore, to appreciate the value, and familiarize ourselves with the nature, of each class of symptoms, it is necessary to study the several affections in an isolated form. We are thus enabled, on meeting with a *compound* case—one consisting of a complication of several of the simple affections—to analyze or unravel the symptoms, ascertain the relative importance of each class, and in this manner establish rational and secure principles of treatment. In conformity with this view, the various articles on the diseases of the heart, instead of being assembled under the present head, are, for facility of reference, diffused alphabetically throughout the work. We have here only to put the whole together in a systematic form, so as, by pointing out the affinities between detached articles, to enable the student to prosecute his studies in a consecutive form, and to find with facility any given article or topic to which he may wish incidentally to refer

Physiology of the heart's action, and physical signs—healthy and morbid. In the article AUSCULTATION will be found a sketch of the physiology of the heart's action according to the principles of the writer, adopted throughout this work, and a general exposition of the principles of auscultation in reference to the heart. A more particular and differential account of the signs afforded by auscultation and percussion will be found in the several articles to which the signs respectively refer: viz.—in the article HEART, (HYPERTROPHY OF THE) are all the signs characterizing this affection, whether simple or combined with dilatation. In DILATATION are the signs of the simple and the attenuated forms of the disease; the other forms, with their signs, being comprised under HYPERTROPHY with DILATATION. In DILATATION the *range of sound*, and in HYPERTROPHY that of *impulse*, is more particularly described. Under HEART, (DISEASES OF THE VALVES OF THE) are the signs of all the varieties of this affection, with the diagnosis from analogous signs produced by nervous derangements: Under AORTA, (ANEURISM OF THE) are the signs of disease of the great vessels, with the diagnosis from nervous affections; and under HEART, (MALFORMATIONS OF THE, and HEART, (POLYPUS OF THE) are the peculiar signs, according to the writer's observation, of those maladies.

We would recommend the student to adopt the following arrangement of the articles in studying the various diseases of the heart consecutively. Inflammatory affections of the heart and great vessels, as they give birth to a large proportion of the organic diseases, should take precedence of the rest. Thus PERICARDITIS leads to ADHESION OF THE PERICARDIUM, (which subject is discussed at the end of PERICARDITIS); and the latter leads to HYPERTROPHY WITH DILATATION. CARDITIS (which is treated of under PERICARDITIS) gives rise to SOFTENING, INDURATION, DILATATION. ARTERITIS, acute and chronic, contains an account of the morbid alterations of the valves and internal membrane of the heart and arteries, to which it gives origin. Under this head, also, the other probable causes of some of those alterations are fully discussed. HYPERTROPHY should next be studied. It embraces the varieties in which it is conjoined with dilatation. After reading this article the student should proceed to DILATATION, in order that, by contrasting the respective varieties, the mode of production, and the pathological effects of hypertrophy, and of dilatation, he may be enabled to form a just and comprehensive idea of the relative nature of the two affections. DILATATION presents an account of those varieties only in which the force of the heart's action is *not* increased: viz.—DILATATION WITH ATTENUATION, and some cases of SIMPLE DILATATION; those in which the action *is* increased being described under HYPERTROPHY WITH DILATATION. After reading HYPERTROPHY and DILATATION, the student should proceed to DISEASES OF THE VALVES, as he is now prepared to understand how these produce their effects, and become causes of hypertrophy and of dilatation. HEART, (DISEASES OF THE VALVES OF THE) comprehends every variety of these affections, with the signs physical and general; and also an account of cardiac asthma. The following diseases of the muscular structure may next be studied: PARTIAL DILATATION, OR REAL ANEURISM OF THE HEART; SOFTENING; RUPTURE; INDURATION; FATTY AND GREASY DEGENERATIONS; PRODUCTIONS, (ACCIDENTAL); ATROPHY OF THE HEART. AORTA, (ANEURISM OF THE) comprising an account of nervous pulsation of the aorta, forms an elaborate article, much original matter being added with a view to establish the diagnosis—one of great importance, and now, we trust, presenting little obscurity: the study of this subject should be deferred till the reader is acquainted with HYPERTROPHY, DILATATION, and DISEASES OF THE VALVES, as he will thus be better qualified to understand how disease of the aorta gives birth to that of the heart, and constitutes one of the most formidable complications of cardiac affections. MALFORMATIONS, ANGINA PECTORIS, POLYPUS OF THE HEART, DISPLACEMENTS, HYDRO-PERICARDIUM, PNEUMO-PERICARDIUM, PALPITATION, particularly nervous and dyspeptic, are severally brought under consideration in separate articles.

Treatment.—In the article PERICARDITIS, the treatment of the inflammatory affections is fully considered. A few remarks are also appended to ARTERITIS. In HYPERTROPHY and DILATATION respectively, the observations on treatment are confined to the immediate and peculiar effects of each disease; while HEART, (DISEASES OF THE VALVES OF THE) is a general article on treatment, not only embracing all the secondary effects, but giving a detailed account of the manner of exhibiting, and the modus operandi of the various remedies employed. In AORTA, (ANEURISM OF THE) the mode of spontaneous cure and the medical treatment are fully explained, and remarks are added on the treatment of nervous aortic pulsation.

We shall conclude this brief explanatory and indicatory notice with a few remarks on the diagnosis and treatment of cardiac affections in general.

Diseases of the heart were formerly involved in deep obscurity. This is no longer the case. By a *conjunction* (and the necessity for this conjunction cannot be too strongly impressed) of the *physical* signs, or those afforded by auscultation and percussion, with the *general* signs, improved as they have been in consequence of being studied with the aid of auscultation, the diseases in question may be detected with a facility and precision which can scarcely be surpassed in any other class of affections. The *direct* practical advantage resulting from this is, that instead of being almost incurable, as they were formerly regarded in consequence of seldom being detected till they had attained an incurable degree, they now, from admitting of detection even in the earliest stage, can in numerous instances be completely cured; and when not, can in general be so far counteracted as not materially, and often not at all, to curtail the life of the patient. The *collateral* practical advantages are no less important. Apoplexy and palsy, in a scarcely credible number of cases, are directly dependent on hypertrophic enlargement of the heart. Should the cause be detected, the effect may be obviated; should it be overlooked, the patient would probably fall a martyr to the "active exercise" supposed necessary to reduce his *apoplectic fulness of habit*. No less frequently are the most dangerous cases of asthma, of dropsy, and of epilepsy, referable to disease of the heart; and this malady seldom occasions long-continued obstruction of the circulation without producing enlargement of the liver,—one of the least generally known of the common facts in medical science. Nervousness and dyspepsia very often assume the aspect of disease of the heart; and this, on the other hand, being frequently productive of nervousness and dyspepsia, may be disguised by, and mistaken for them, though with the aid of auscultation the diagnosis presents no difficulty. In acute rheumatism the most formidable source of danger is inflammation of the pericardium. Inflammation of the lungs supervening on organic disease of the heart is singularly rapid, uncontrollable, and destructive. In fever and inflammation in general, the state of the pulse as to fulness, hardness, weakness, or irregularity, may be completely disguised by a co-existent disease of the heart. In all the above instances the appropriate treatment would differ widely and perhaps entirely from that which the practitioner would probably adopt were he to remain ignorant of the affection of the heart.

This brief sketch is sufficient to display the extensive relations and vast importance of the subject of cardiac affections, and to show, that unless the practitioner be conversant with it, not only may he compromise the safety of his patient, but his reputation must be responsible for many mortifying falsifications of his diagnosis, and for the blind impression that danger was remote when it was at the threshold.

HEART, (DILATATION OF THE)—The disease commonly known by this name consists of an amplification of one or more of its cavities. The ventricular parietes may be thickened, natural, or attenuated. The disease accordingly resolves itself into three varieties, corresponding with these states.

1. *Dilatation with thickening*, in which the cavity is enlarged and the walls are thickened.

2. *Simple dilatation*, in which the cavity is enlarged and the walls are of their natural thickness.

3. *Dilatation with attenuation*, in which the cavity is enlarged and the walls are attenuated.

The first variety is identical with that variety of hypertrophy called hypertrophy with dilatation, different names being employed for the two, in order to express, in dilatation with thickening, a predominance of dilatation, and, in hypertrophy with dilatation, of hypertrophy. The second variety is perfectly identical with hypertrophy by increased extent, with natural thickness of the walls; but the term simple dilatation is preferable when the dilatation is so great that its symptoms predominate over those of hypertrophy. Two, or all three of the forms of dilatation are sometimes found together in different parts of the same cavity.

The anatomical characters of simple dilatation and that with thickening will be described in the article on Hypertrophy. To dilatation with attenuation we here direct our attention. It seldom affects one ventricle without the other. The emaciation may be such as to reduce the most substantial part of the left ventricle to two lines in thickness, and the apex to a mere membrane, of which we have seen more than one instance. Extreme attenuation is more common in the right than in the left ventricle. In either, the columnæ carneæ appear stretched and spread. The interventricular septum is proportionably much less attenuated and softened than the other parts. Dilatation takes place more in the transverse than in the longitudinal direction of the ventricles, and it accordingly communicates to the heart an unusually spherical form, so that the diameter of the organ near the apex is almost as wide as at the base, the apex itself being often scarcely distinguishable. This alteration of shape is the best criterion for determining whether a heart be dilated or not when the enlargement is so inconsiderable as to render the question doubtful. When both the auricle and ventricle are much dilated, it is not unusual to find the intermediate aperture widened, and its valve sometimes not large enough to close it. The muscular substance, sometimes healthy in every form and degree of this affection, in general is not so. For, when the organ is considerably enfeebled, its parietes are usually more or less softened and flaccid, and in some cases of a deeper red, (a consequence of venous engorgement,) in others paler or more fawn-coloured than natural.

Dilatation may give rise to rupture of the heart, especially as it is so often attended with softening. We witnessed a case of this kind a few years ago, and are acquainted with others.

In order to judge accurately of dilatation of the auricles, it is necessary to have distinct ideas respecting their natural form and dimensions. The four cavities of the heart are very nearly equal in capacity; but, as the parietes of the auricles are thin, and those of the ventricles are comparatively thick, the auricles, when merely full, and not distended, form only about one-third of the total volume of the organ; or, what is the same thing, the volume of the auricles equals about half that of the ventricles. (*Laennec*, de l'Auscult. tom. ii. p. 523.) The right auricle being of a more elongated, flattened form than the left, and being generally found in a state of distension, has the appearance of being considerably larger, though in reality it is only a little so.

Distension, taking place during the last moments of life, and observable, though more rarely, in the left auricle as well as in the right, constitutes the great source of fallacy in determining, after death, whether these cavities are really dilated or not; for the engorgement, though only of a few hours' duration, may stretch them to a magnitude almost equalling that of the ventricles.

M. Laennec has given good criteria by which a dilated may be distinguished from a distended auricle. An auricle simply distended is tense, and through its thinnest parts distinctly shows the dark blood within. One dilated does not present the same appearance of tension, and its parietes are more opaque. When the blood is evacuated through the vessels without cutting into the cavities, the latter, if merely distended, return at once to nearly their natural size; whereas, if dilated, they maintain almost the same size as they had when full. Dilatation of the auricles is almost invariably accompanied with more or less thickening of their parietes.

The method of distinguishing distension from dilatation is much the same in the ventricles as in the auricles: namely, when merely distended, they are found enlarged, firm, and tense; but these conditions almost entirely disappear when the blood is pressed out through the natural apertures. On the contrary, when truly dilated, they have no appearance of tension, are more or less flaccid, and the enlargement persists after the blood has been evacuated.

Dilatation of the heart is a purely mechanical effect of over-distension. Blood, accumulated within its cavities, exerts a pressure from the centre towards the circumference, in every direction; and when once it surmounts the resistance offered by the contractile and elastic power of the parietes, these naturally yield and undergo dilatation. The rapidity with which this process takes place, and the extent to which it is carried, depend on the degree in which the distending exceeds the resisting force; and as the latter bears a direct ratio to the volume of the muscle, supposing it to be healthy, it follows that those cavities which have the thinnest parietes are, *cæteris paribus*, the most susceptible of dilatation. Accordingly, we find that the right ventricle is more frequently and promptly dilated than the left, and the auricles than either.

In order to produce permanent dilatation, the operation of the exciting cause must either be prolonged for a certain time, or frequently repeated at brief intervals. Contraction of an orifice, for instance, acts in the former manner; and nervous palpitations, or occupations requiring constant reiteration of muscular efforts, produce their effect in the latter way. When the operation of the cause is only brief and transitory, the result is merely a temporary *distension*, from which the muscle recovers itself by its own elastic and contractile re-action so soon as the distending force is removed. This cannot be regarded as a pathological state, and it must, therefore, be carefully distinguished from genuine dilatation.

The exciting causes of dilatation are, 1st, deficient power of the heart, whether congenital or acquired, in proportion to the system; 2d, in general terms, all obstructions to the circulation, whether situated in the orifices of the heart, or in the aortic or pulmonary system. The latter class of causes are, in fact, essentially the same as the exciting causes of hypertrophy; for it depends on the proportion which the resistance of the muscle bears to the distending force, whether the one affection or the other is produced. When, therefore, dilatation occurs in one of the cavities with naturally thick walls, in which we should more properly expect hypertrophy, it must be ascribed either to a congenital disproportion of the heart, in consequence of which the cavity in question is thinner, and therefore more disposed to dilatation, than natural; or it must be attributed to the obstruction, from its nature or situation, bearing more in proportion on that particular cavity than on any other. It is from having overlooked these considerations respecting the relations of the resisting and distending forces to each other, that some have excluded dilatation from the catalogue of mechanical diseases, and supposed that it takes its rise in any cavity of the heart either by chance or by some vital predilection — some vague, unintelligible predisposition.

Dilatation occasionally affects only a single ventricle, and it is generally the right; but much more commonly it attacks both. The auricles, being protected by their valves from the direct influence of the numerous causes of pressure which operate on the ventricles, are far more exempt than they, both from dilatation and hypertrophy. But when the auricular valves are diseased, whether their state be that of contraction, which impedes the transmission of the auricular blood, or of permanent patescence, which allows a regurgitation of the ventricular, the auricles, suffering unnatural distension, become dilated.

It is seldom that dilatation of the auricles occurs under any other circumstances than those of disease of their valves; so seldom, indeed, that Laennec does not recollect to have seen an instance, though he does not deny the possibility of the occurrence. More instances than one, however, have fallen under our own observation, and we have generally found the dilatation connected with some circumstances incapacitating the ventricle from freely evacuating its contents. It is natural, indeed, to suppose that when such is the case, the stagnation of blood in the ventricles must, for the time, have an effect in distending the auricle equivalent to that produced by contraction of the auriculo-ventricular valve; and considering the frequency of stagnation in the right ventricle, we might at first expect dilatation of the corresponding auricle from this cause to be frequent. But it must be remembered that, for the production of the disease, it is necessary that the operation of the cause be permanent, or at least very prolonged. Such, however, is seldom the case with the stagnation in question; for a ventricle, though so feeble in itself, or so encumbered by an obstacle before it in the course of the circulation, as to become gorged during an accelerated state of the heart's action, will, when tranquillity is restored, transmit its contents with a facility that could scarcely be anticipated. During such intervals, therefore, the muscular fibres of the auricle recover their contractile power, and restore the cavity to its natural size.

M. Bertin contends that dilatation is never a *primitive* malady, but merely a consecutive effect of a pre-existing lesion — of an obstacle to the course of the blood; and that the symptoms produced by such obstacles, viz. vascular engorgement, dropsy, passive hemorrhage, &c. have no other relation to dilatation than as being results of the same cause — the obstruction of the circulation.

We cannot concur with M. Bertin in these opinions. It is true that, in order to produce dilatation, there must exist a weight or pressure of the circulation upon the heart greater than the organ is capable of sustaining; and it is true that such pressure may be occasioned by the mechanical obstacles to which M. Bertin ascribes it, namely, contraction of the orifices of the heart, diseases of the aorta, and all maladies which impede the course of the blood, whether in the lungs or in the system of the great circulation. (*Bertin*, p. 380.) But it is equally true that the same pressure on the heart may result, not from increased weight of the circulation, but from deficient power of the heart; and such is its cause in those who, by original conformation, have the organ thin in proportion to the size of the body. Another class in whom debility of the heart exists as a cause of dilatation, comprises those who have had the organ softened or otherwise enfeebled by disease; an effect not unfrequently produced by typhoid fever, and by inflammation of the substance and membranes of the heart.

Dilatation, then, occurring under the circumstances described, is as justly entitled to the rank of a *primitive* disease as hypertrophy; for as in both the disease depends, not on the pressure of the circulation, but on the manner in which the heart resists that pressure, in both the organ itself is the part where the disease originates; the only difference being, that in the one case the effect is produced by deficient, in the other by superabundant, power of the muscle.

In the next place, M. Bertin has, in our opinion, attributed far too much to the lesion of which he considers dilatation to be the effect, when he says that this lesion is the sole cause of all the symptoms which authors have been in the habit of ascribing to dilatation. It is true that when the lesion is so great as to constitute an extreme obstacle to the circulation, it may produce the symptoms in question; but it does not produce them, or produces them only in a very slight degree, when the obstacle is not extreme. We have repeatedly witnessed cases in which a well-marked if not a considerable obstacle, as a contracted valve, or a dilatation or aneurism of the aorta, had subsisted for a long period, even for years, without producing any material symptoms of an obstructed circulation; but the moment that dilatation of the heart supervened, the symptoms made their appearance in an aggravated form. We apprehend, therefore, that the heart is the part mainly concerned in their production; nor do we think this opinion less tenable because the symptoms are more severe when enlargement of the heart coexists with an obstacle than when the enlargement exists alone; for it is natural to suppose that when two causes conspire to produce the same effect, that effect will be greater. But this is not all; for not only does each produce its own effect, but one increases the effect of the other; namely, the obstacle adds so much to the pressure of the circulation on the heart, that this organ labours under a double disadvantage, first, from its own diminished power, and, secondly, from a preternatural pressure upon it. Thus the resulting effect of the obstacle and the dilatation of the heart combined, is greater than the sum of the two taken separately.

In further invalidation of M. Bertin's opinion, we may add that we have seen numerous instances in which all the phenomena of an obstructed circulation were occasioned by dilatation alone, as no other obstacle capable of accounting for them could be detected in the course of the circulation.

According to the foregoing arguments then, it appears, first, that dilatation may be a *primitive* disease, and that, as such, it is capable of producing all the phenomena of an obstructed circulation; secondly, that when it is consecutive to another lesion, it plays a prominent, and perhaps, even, in some cases, a more important part than that lesion in producing the phenomena of an obstructed circulation.

In order to ascertain the *real* effects of dilatation, it is necessary to confine ourselves, in studying them, to the simple uncomplicated form of the disease.

Taking into consideration this form alone, and admitting, on the foregoing grounds, that it is capable of producing all the phenomena of an obstructed circulation, we have next to inquire how, or by what mechanism, it produces them. To answer this question, — it produces them by putting the muscular fibres of the heart preternaturally on the stretch, whereby their contractile power is diminished; they lose, as it were, in force what they gain in length; and it is this deficiency of power in the main-spring of the circulation which constitutes the obstacle, if it may be so called, to the circulation, in the same way that weakness of the spring of a time-piece retards its movements.

Diagnosis of Dilatation. — *General signs.* —We have shown that the effect of dilatation is to enfeeble the heart, and thereby occasion the phenomena of an obstructed circulation. We have now to examine these phenomena as signs of dilatation.

The heart, when dilated, is subject to palpitations of a feeble oppressed kind, and more or less distressing, frequent, and prolonged, according to the extent of the malady. The attacks are provoked by any over-exertion or mental excitement. The pulse is soft and feeble, and if the debility of the heart be very considerable, it is small. Irregularity and intermittence are rare, except during severe dyspnœa, or when the vital powers are much exhausted, as in the extreme stage of the disease.

The languor of the arterial circulation causes the extremities and surface to be chilly, the disposition to be melancholy, and the character to be deficient in energy. The blood, not being freely transmitted by the left ventricle, accumulates by retardation in the lungs; whence difficulty of respiration; cough, sooner or later attended with copious expectoration of thin, serous mucus; œdema of the cellular tissue of the lungs, greatly aggravating the dyspnœa; terrific dreams, with starting from sleep; and passive pulmonary hemorrhage of dark, grumous blood in small quantities, forming sanious sputa, and generally the precursor of death when it occurs in individuals affected with extreme difficulty of respiration. The lungs being obstructed, the engorgement is propagated backwards to the right side of the heart, to the great veins, and finally to all their ramifications. From this venous engorgement arises a series of striking phenomena, which we shall review successively.

1. *Serous Infiltration.*—This generally makes its appearance first in the lower extremities, because it is in them that the circulation is most languid, the return of the blood being opposed by

its gravity: while about the feet and ankles it is little promoted by the action of superincumbent muscles. Increased serous exhalation takes place in the serous membranes also; hence hydrothorax, hydro-pericardium, and ascites, one or other of which is almost invariably present when there is much external dropsy.

2. *Discoloration of the Face.*—If the complexion was originally florid, it becomes purple or deep violet, principally on the cheeks, the end of the nose, and the lips, with intumescence of the latter. If originally pale, it becomes cadaverously exanguious, and has a dusky, leaden cast, especially about the eyes. The lips are either livid or totally colourless. Lividity sometimes shows itself in the extremities as well as in the face.

3. *Congestion of the Brain.*—This produces sub-apoplectic symptoms, as dull headach, felt principally along the course of the great sinuses; hebetude of the mental faculties; stupor, convulsions, and eventually complete coma. It is not unusual for these symptoms to supervene a few days before the fatal termination. Sometimes they depend not on congestion alone, but partly also on serous effusion into the ventricles. This, however, is not always the case, as we have ascertained by several dissections.

4. *Injection of the Mucous Membranes.*—It is common to find them after death so vascular as to present the appearance of inflammation. This is especially the case in the stomach and intestines, and it is necessary to be aware of the circumstance, in order to guard against the error of attributing the redness to inflammation.

5. *Passive Hemorrhage.*—This takes place from the lungs, as already stated, from the nose, the stomach, the intestines, and more rarely from the bladder. It results from engorgement of the mucous membranes. The effusion consists of dark blood exuding in small quantities. When from the stomach, it has occasionally the appearance of coffee-grounds.

6. *Congestion and Enlargement of the Liver.*—This is so common a consequence of retardation of the circulation on the right side of the heart, that few persons so affected in any considerable degree are exempt from it. By the obstruction which it occasions in the system of the vena porta, it leads to ascites.

The sign which, with Laennec, we think the most constant and characteristic of the *equivocal* signs of *dilatation of the right ventricle* in particular, is permanent turgescence of the external jugular veins *without sensible pulsation.* This turgescence does not disappear when the vein is compressed at the upper part of the neck.

Dilatation of the auricles presents no general signs distinguishable from those of disease in the corresponding ventricle or valve, to which it owes its origin; but its existence may be inferred when the valve in question is either much obstructed or permanently open, or when, from any cause, there is great retardation of blood in the ventricle.

Physical Signs.—The signs of the two first varieties of dilatation, namely, that with a thickened, and that with a natural thickness of the walls, are given in the article on hypertrophy. It only remains for us to describe the signs of the third variety, or *dilatation with attenuation.*

The Impulse.—In this variety the impulse is diminished, and in extreme cases entirely absent, even during palpitation. When felt, it is only a brief percussion of the thoracic parietes, not elevating the ear. When the dilatation is great, the impulse is a little lower down than natural. It sometimes happens that, of several beats of the heart that are *heard,* one only is *felt;* and if this be vigorous, it warrants a conclusion that the parietes are little attenuated. Though Laennec does not make this observation, we have assured ourselves of its accuracy by numerous post-mortem examinations.

The Sounds.—When the walls of the ventricles are merely thin without being dilated, the first sound (the sound produced by the systole of the ventricles) is louder, shorter, and clearer than natural; it approximates in its character to the second sound, (that produced by the diastole of the ventricles,) which is analogous to the flapping of a pair of bellows. When there is dilatation, even in a moderate degree, the first sound becomes almost the same, and nearly as strong as the second; and finally, when the dilatation is considerable, the two sounds cannot be distinguished either by their nature or intensity, but solely by their respective relations of synchronism or anachronism with the arterial pulse. The pulse in remote arteries, as the radial, often being, in dilatation and various other diseases of the heart, later than the ventricular systole, the pulse of the carotid or subclavian should be felt.

In proportion as the sounds of the heart are louder, they are audible at a greater distance over the chest; accordingly, M. Laennec has proposed a scale by which the extent is made an index of the degree of dilatation and attenuation. Before describing this scale, it is necessary to acquaint the reader with the range of the sounds in the natural state.

In a healthy man, of medium stoutness, and whose heart is in the best proportions, the sounds, according to Laennec, are audible in the præcordial region alone; that is, in the space comprised between the cartilages of the fourth and seventh left ribs, and underneath the inferior half of the sternum; also, if the sternum be short, in the epigastrium. We have generally thought that they may be heard a little beyond this range. The sounds are similar and equal on the two sides of the heart, those of the right being most audible under the sternum, and those of the left under the cartilages of the ribs. When audible beyond the limits mentioned, they are heard successively in the following places, constituting the scale alluded to:—viz. 1st, along the sternum and on the left superior anterior part of the chest as high as the clavicle; 2d, over the same extent on the right side; 3d, on the left side of the chest, from the axilla to the region of the stomach; 4th, on the right side over the same extent; 5th, on the posterior left side of the chest; 6th, on the posterior right side. The intensity of the sound is progressively less in the succession indicated, provided the parts around the heart are in the same states. But there are so many diversities in these states, which may interfere with the order described, that we have found the scale of M. Laennec of little practical utility in estimating the degree of dilatation. Thus, in very fat subjects, in whom the impulse of the heart is not perceptible to the hand, the space over which its healthy sounds can be heard by the cylinder is much more limited than natural: Laennec has even found them confined, in some instances, to a square inch, though we cannot say that this has occurred to ourselves. On the other hand, in meagre persons, in those who are narrow-chested, and in children, the sounds are audible much further than ordinary: namely, over the two inferior thirds, or even three-fourths of the sternum, sometimes even over the whole of that bone, and at the left anterior superior part of the chest as high as the clavicle; often, also, though less distinctly, below the right clavicle. In very meagre subjects, we have heard them over the whole chest, both posteriorly and anteriorly. Now, as it is almost impossible to make an exact estimate of the degree in which stoutness limits, and leanness, &c. extend the range of the sounds, this range is not a sure criterion of the degree of dilatation.

Again, a lung in any way consolidated, whether by hepatization, tubercles, or compression by fluid in the cavity of the pleura, transmits the sounds of the heart more readily than a lung that is sound and permeable to air — a phenomenon explicable on the principle that dense bodies are the best conductors of sound. The effect is the same, though there be cavities in a tuberculous lung; for the sound is transmitted, not through the cavities, but through their walls, which are denser than healthy pulmonary tissue.

Under these various circumstances then, the sounds are irregularly propagated, and the progressive scale of Laennec is interfered with. For instance, if the right lung be consolidated, the sounds will be more audible on that side than on the left.

Our own mode of estimating the degree of dilatation is, by observing how far the first sound resembles the second, and comparing the intensity of the first, heard immediately over the ventricle affected, with what we believe, from experience, would be its intensity in the same subject if the heart were healthy. We then corroborate the estimate, if necessary, by the scale of Laennec, making allowances, as far as is practicable, for stoutness, leanness, youth, pulmonary condensation, &c. The manner in which we judge of attenuation by the first sound, is less by its loudness than by its remarkable shortness and clearness; for we think it is often louder in dilatation with hypertrophy, or even with a natural thickness of the parietes, than with attenuation. This opinion is opposed to that of Laennec, who "thinks he may regard it as constant, that the extent over which the beats of the heart are audible, is in the direct ratio of the feebleness and thinness of its walls." So far is this from being perfectly true, that we have met with cases in which the heart was dilated and attenuated to the extreme, yet the first sound was feeble: nor should we expect it to be otherwise in such cases; for when the heart, from extreme dilatation, is too feeble to contract smartly, its sounds must necessarily be weak. Hence they are so in ramollissement, and in the moments preceding dissolution.

Resonance on Percussion.—The resonance of the præcordial region on percussion is diminished by dilatation. The dulness is situated rather lower down than natural, and as it is always in proportion to the increase of volume of the heart, it is greater in hypertrophy with dilatation than in mere dilatation. Dulness of the præcordial region on percussion may exist independent of the enlargement of the heart; namely, when the anterior borders of the lungs are hepatized, and extend in front of the heart. On the contrary, dilatation sometimes does not occasion deficient resonance when the lungs are emphysematous, and their anterior margins are forced between the organ and the sternum.

Physical Signs of Dilatation of the Auricles.—Auscultation has not hitherto supplied any *direct* signs of dilatation of the auricles; but as this affection is in general the consequence of disease of the valves, and of enlargement of the ventricles impeding the circulation through the heart, its existence may be inferred from the presence of signs of these affections.

Prognosis.—In many persons the heart, without being dilated, has naturally thin walls: those of the left ventricle, for instance, are not, at the utmost, more than twice the thickness of those of the right. This state presents the same signs as dilatation, but in a less degree; namely, the impulse is diminished, the first sound is loud, short, and clear, and both sounds are more extensively audible than natural. Individuals so affected may live for a great number of years,—even to an extreme old age, in a state of tolerably good health: it is only to be remarked that this conformation is in general accompanied with a delicate constitution, a slim stature, and small muscles. In fevers and diseases of the respiratory organs, the individuals in question experience, cæteris paribus, greater dyspnœa than others. If such a conformation augment, even slightly, a dilatation of the heart is the result.

A slight degree of dilatation is not a very formidable affection. The dyspnœa is sometimes not so great as to deserve the name of *morbid*; but the patient has merely a shorter respiration than most men, he more readily loses breath, and experiences palpitations from much slighter causes. With these slight symptoms, however, he generally exhibits some traces of the cachexy proper to organic disease of the heart. The state described, which is that of a great number of *asthmatics*, may subsist very long without occasioning any disorder of a serious nature; it may remain without making progress for a great number of years, and it does not always prevent the patient from attaining an extreme old age.

When dilatation has advanced so far as to occasion *morbid* dyspnœa, it has a constant tendency to increase unless the circulation be kept tranquil by a very quiet life, and by judicious medical treatment when necessary. With these precautions the disease may be kept stationary, sometimes for an indefinite period, if not exasperated by fevers or inflammatory affections, which, by hurrying the circulation, are eminently prejudicial.

When dropsy comes on, and, after having been removed by remedies, constantly shows a disposition to return, we may know that the dilatation tends to its fatal termination: and although the patient may sometimes rally from five, six, or even more attacks, he generally sinks in the course of one or two years or less. The progress of dilatation with hypertrophy is much more rapid, as explained in the article on HYPERTROPHY.

The general prognosis is founded on the above considerations, and is favourable so far as life is immediately concerned. The particular prognosis depends upon the degree of severity of the symptoms and on the constitution of the patient.

Treatment.—The treatment of dilatation with *increased* power of the heart, that is, with hypertrophy, is described in the article on hypertrophy. In this place we have only to speak of the treatment of dilatation with *diminished* power, that is, with attenuation, and sometimes even with a natural degree of thickness of the parietes.

The first indication is, to remove, if possible, the exciting cause of the dilatation; and if this be done before the disease has proceeded to such an extent as entirely to deprive the muscular fibre of its resilience and elasticity, these faculties come into operation and restore the organ to its natural size. Accordingly, if the cause be an obstruction in the pulmonary circulation, as that produced by peripneumony, hydro-thorax, or pneumo-thorax, emphysema, the use of wind instruments, ventriloquism, tubercles, &c., the attention must be primarily directed to the removal of these affections and the prohibition of these habits. If the cause be, too violent exercises or passions, inebriety, occupations which, by placing the patient in a constrained posture, prevent the free circulation of the blood, as in shoe-makers, tailors, &c., the pernicious exercises, habits or occupations must be abandoned and the passions calmed. All the causes enumerated being of a temporary nature, the dilatation resulting from them, if not inveterate, can often be removed. But when the cause is permanent, as the contraction of an orifice of the heart, or a natural or acquired feebleness of the organ in proportion to its function, a cure of the dilatation is scarcely to be expected; but it may often be prevented from increasing, and the life of the patient may sometimes be prolonged even to its extreme limits. In such cases, therefore, the practitioner should steadily and perseveringly pursue a palliative and prophylactic treatment, having first discarded from his mind the impression, no less erroneous in itself than detrimental to the progress of medical science, that organic diseases of the heart are necessarily fatal, and that, therefore, all treatment is unavailing.

The circulation should be kept as tranquil as possible by a quiet life and a moderate unstimulating diet. The food, however, should be rather nutritious, comprising a little animal food or soup twice a day, in order to keep the muscular system in general, and that of the heart in particular, in good tone. The same object may be promoted by a clear, dry, bracing air, (as that of Brighton,) and by the shower-bath; from both of which we have seen the best effects result. Neither of them, however, have we found to suit those patients who have great pulmonary congestion with copious expectoration; as such require a warm humid atmosphere to favour expectoration and the cutaneous function, and they cannot bear the shower-bath on account of its determining too much from the surface to the heart and great vessels: neither can they well bear opiates, as these remedies partly occasion diminished mucous secretion, and partly accumulation of that already secreted; both of which circumstances increase the dyspnœa. The general health and strength may likewise be improved by the occasional exhibition of bitters, mineral acids, and chalybeates, with aromatics. The stomach, in particular, should be kept in good order, as its derangements—even a little flatulence or acidity—have a surprising effect in disturbing the action of the heart. The same may be said of the biliary secretion. When there is an unequal distribution of nervous power, indicated by hysterical symptoms, &c., antispasmodics, particularly the piluli galbani composita and valerian, are very useful adjuncts to other remedies.

Febrile and inflammatory affections of every kind, but particularly inflammation of the lungs and bronchi, should be sedulously guarded against, and, when occurring, should be promptly treated. Even a slight pulmonary catarrh should be viewed as a serious affection. To prevent colds and relieve the heart by keeping up the circulation on the surface, flannel next to the skin is almost indispensable; and, if the patient be chilly, as is frequently the case in dilatation, a jacket of wash-leather should be worn over the flannel during winter.

Attacks of dyspnœa are best relieved by immersing all the extremities in warm water, a blanket being thrown round the patient to promote perspiration, and fresh cool air being admitted to satisfy the craving for breath. While this is being done, he should take an antispasmodic draught composed of ether, laudanum, camphor, ammonia, and assafœtida, combined according to circumstances. (See treatment of HEART, DISEASES OF THE VALVES OF THE.) It may be repeated two or three times, at intervals of from half an hour to an hour according to circumstances.

Bloodletting should not be resorted to in dilatation with deficient power of the heart, *during the paroxysm*, and merely for the purpose of relieving it. The abstraction of a small quantity has not the effect, and that of a large quantity is inadmissible, as it does more injury by increasing the debility of the heart and the system, than it does good by lightening the circulation; and consequently, an ultimate aggravation of dyspnœa ensues. More than once have we seen a large and indiscreet bloodletting fatal, as the patient could not rally from the exhaustion produced by the attack of dyspnœa to which that from the depletion had been superadded. If there be an absolute necessity for bloodletting—that is, if the dyspnœa be constant, and cannot be relieved by any other means—the quantity drawn should not exceed six ounces at one time; and it should be drawn very slowly, in the recumbent position, and during the intervals or remissions of the fits. In this way the bleeding may be repeated, if necessary, every one, two, or three months, provided it does not diminish, but rather increases, the strength of the patient.

For the treatment of dropsy, cough, &c., we refer the reader to the article on HEART, (DISEASES OF THE VALVES OF THE.)

[See on this subject Dr. Hope's *Treatise on*

Diseases of the Heart, Amer. edit., by Dr. Pennock, p. 288,—Philad., 1842.]

J. Hope.

HEART, DISPLACEMENT OF THE.—*Ectopia cordis*, from ἐκτοπίζω or ἐκτόπιος, displaced. The human heart, when occupying its natural position, is situated in the left side of the thorax, behind the sternum and cartilages of the true ribs, and between the right and left lungs. In this situation it is placed obliquely, so that if a line were passed through its axis at the moment of its pulsation, its direction would be downwards, forwards, and to the left side. Its base is placed almost directly opposite the eighth dorsal vertebra, from which it is separated by the œsophagus and aorta, while its apex is turned forwards and obliquely over to the left side; so that it corresponds, when in a state of repose, to the cartilage of the sixth true rib, and strikes during its pulsation between the cartilages of the fifth and sixth left ribs, at a point about two inches below the nipple, and one inch on its sternal side. The inferior or posterior surface of the heart is flat, and rests upon the tendon of the diaphragm, which supports it; its superior or anterior surface is convex, and is overlapped by the anterior edges of the lungs. From this, which may be considered the natural position of the heart, numerous forms of deviation have been observed, from a slight alteration in the direction of its apex, to the total displacement of the organ from the interior of the chest.

Displacement of the heart may occur as a *congenital malformation*, or as *the result of accident or of disease*.

I. Some of the congenital displacements are very similar to those into which the heart is sometimes forced by diseases of the pleura or lungs, or even by certain organic affections of the heart itself; others, again, are liable to be mistaken for aneurismal tumours or other organic diseases of the heart or large vessels, and might, therefore, mislead the physician into the most serious errors of diagnosis, and consequently of practice, if the possibility of their occurring as a congenital malformation were not borne in mind. For this reason we shall give a succinct account of the principal congenital displacements of the heart, referring the reader who wishes for more ample details on this interesting subject to the excellent, "Mémoire sur l'ectopie du Cœur," published by M. Breschet in the second volume of the "*Repertoire Général d'Anatomie*," and to Dr. Paget's "Inaugural Dissertation on the congenital Malformations of the Heart." (Edinburgh, 1831.)

The congenital displacement of the heart may be divided into two classes: the first comprising those cases where the heart is contained within the chest, but does not occupy its natural situation there; the second containing those cases of malformation where the heart is situated out of the cavity of the thorax.

Cases of this description, though of not very unfrequent occurrence, from the slight inconvenience they occasion, have received comparatively little attention; yet from the resemblance they bear to the displacements produced by disease, they are, perhaps, the most interesting and important to the practical physician. The following are the principal deviations from its natural position dependent on congenital malformation which the heart presents while still situated within the thorax.

Instead of being placed diagonally to the axis of the body, with its apex pointing to the left side, it may be situated, *a.* horizontally; *b.* vertically, with its apex pointing downwards: *c.* vertically with its apex pointing upwards; *d.* diagonally, with its apex pointing to the right instead of the left side; or *e.* transposed altogether to the right side of the chest.

a. The heart has, we are informed, been found in the horizontal position; (Mémoires de l'Académie des Sciences, quoted by Breschet;) but this deviation is of very rare occurrence as a congenital malformation, and it may perhaps be doubted whether the effects of disease have not been mistaken for such. We shall presently see that this alteration in the position of the heart is, as was remarked by Bertin, constantly produced by the enlargement of that organ from hypertrophy.

b. The heart has occasionally, though very rarely we believe, been found in the centre of the thorax, occupying a vertical position, as in quadrupeds. A case of this kind is described by Breschet. (Mémoire cit. page 17.) The infant was born at the full time, lived six weeks, and exhibited no external malformation: the heart, which was composed of a single auricle and ventricle, was situated exactly in the median line of the thorax, its apex having a slight inclination towards the left side. Another case, described by Klinn, (Acta Academiæ, Cæs. reg. Joseph. tom. 1, page 228,) is usually quoted as an example of this species of malposition; but there can be little doubt, even from his own description, that the displacement of the heart was caused by the pressure of an effusion which had taken place into the left sac of the pleura.

c. A much greater alteration in the position of the heart, where the organ was so completely subverted that its basis was inferior and its apex superior, is related by Ignatius de Torres. "In a new-born female infant, the heart, destitute of a pericardium, was turned upside down, so that its basis with all the great vessels had fallen down as low as the navel, and its apex, still in the left side, lay hid between the two lungs." (Phil. Trans. abridged, vol. viii. p. 509.)

d. The direction of the apex of the heart to the right side, and the situation of the entire organ more or less to the right of the mesial line, is among the most common of the situations which the heart occupies when out of its usual place.

c. Breschet dissected four cases in the Foundling Hospital at Paris, where the heart was situated at the right side, without any of the other viscera being transposed. (Op. cit.) Otto, (Handbuch der patholischen, &c. Breslau, 1814,) Moellenbrock, (Miscell. natur. curios. dec. 1, ap. obs. 76,) Mohrenheim, (Wiener Beitrâge, etc. tom. 2, page 305,) and Elvert, (De phthisi pulmonali, etc. Tubing. 1780,) have likewise described this species of congenital displacement.

In the greater number of cases where the heart is placed from birth at the right side, there is also a similar transposition of the other thoracic and of the abdominal viscera. A case highly illustrative of this general transposition of the viscera is recorded by Dr. Bryan in the Transactions of the College of Physicians of Dublin, and the specimen is preserved in the superb museum of the College of Surgeons of that city.

The apex of the heart, instead of pointing towards the left, corresponded to the interval between the fifth and sixth ribs of the right side; its auricles and ventricles occupied a position exactly the contrary of their ordinary relative situations; and the aorta, which gave off those vessels to the right that it usually furnishes to the left, descended along the right side of the vertebral column. The left lung was divided into three lobes, while the right had only two. The pyloric orifice of the stomach was turned towards the left hypochondrium, which was occupied by the liver, the spleen being at the right side. The whole intestinal tube was transposed in like manner, the cæcum resting on the left iliac fossa, &c. &c. In short, all the parts usually situated at the right side were placed at the left, and *vice versa.*

The subject of this case, we are informed, was a woman advanced in life, who had borne several children, and enjoyed good health until a short time before her death. The appearances found on dissection in the kidneys, uterus, and bladder, sufficiently accounted for the symptoms under which she suffered; but no suspicion was entertained that there existed any thing peculiar in her conformation, nor did the displacements lead to any particular symptom—not even to a preference of using her left hand.

We have been informed by Dr. Kennedy, that a respectable middle-aged female presented herself last summer at the Dublin General Dispensary, complaining of dyspnœa and distressing palpitations. On examinatior with the stethoscope, it was discovered that the heart was pulsating at the right side, and no disease could be detected in any of the thoracic viscera to account for the displacement; in addition to which the woman positively avowed that she had felt her heart beating in the same place as long as she could remember. The physician to whom we are indebted for these particulars seemed to entertain little doubt that the displacement in this case was congenital.

The second class of congenital displacements of the heart, comprising those cases of malformation in which that organ is situated out of the cavity of the chest, may be divided into those where the heart is situated on the surface of the body, and those where it is situated in the interior, but not in the thorax.

"The first kind, in which the heart is on the outside of the body, includes some of the most fatal as well as most frequent cases of exposition of this organ. It is generally connected either with deficiency in the diaphragm and abdominal muscles, or with absence of some part of the walls of the thorax. In the former case, we generally find the heart, liver, and stomach, and often the lungs, and all the abdominal viscera, contained in a sac, sometimes covered only by peritoneum, (Archives Générales, tom. 23. p. 511,) sometimes by an extension of the common integuments, (*Meckel,* Dissert. inaugur. page 6, Acta Helvetica, vol. vii. p. 56, de fœtu monstr. &c.,) and sometimes occupying the sheath of the umbilical cord, (Rep. Gén. d'Anat. tom. ii. p. 25,) forming a variety of umbilical hernia." (*Paget,* op. cit. p. 33.)

Protrusion of the heart may likewise take place through a fissure, or deficiency in the sternum or ribs. Some cases of this description are quoted by Breschet in the Mémoire already so often alluded to; they seem to have arisen principally from a deficiency in the lower part of the sternum from the imperfect development of that bone, and were not accompanied with any other malformation. Such cases are, however, exceedingly rare in comparison with those where the fissure of the sternum and the protrusion of the heart through it are accompanied with other malformations arising from a defective development of the parietes of the different cavities from the circumference towards the centre, such as large apertures in the parietes of the chest and abdomen with hernia of their contents, spina bifida, cleft palate, hare-lip, open perineum &c.

When the heart is situated in the interior of the body, but not within the chest, it may be found either in the abdomen or in the neck.

Heart Situated in the Abdomen. — Ramel relates the case of a girl ten years of age, whose heart was placed from birth below the diaphragm, in the situation usually occupied by the stomach. During infancy she did not appear to suffer any inconvenience from the malposition, and as she grew up it was only on crying violently, or using any particular exertion, that she was seized with palpitations, dyspnœa, and occasionally with epistaxis. Ramel attended her for two years, during which time her health and strength continued to improve, until it seemed at length as if nature had become completely reconciled to this unusual arrangement of the circulating system. (Journal de Médecine, tom. xlix. p. 423.) Another case of this species of malposition of the heart was found by Dr. Wilson in an infant seven days old. (Phil. Trans. 1798, p. 346.) The central and tendinous portion of the diaphragm was deficient, as was also the inferior portion of the pericardium. The heart, consisting of a single auricle and ventricle, was lodged in a deep groove on the convex surface of the liver. In this case there were several other malformations of the principal blood-vessels, as well as of the abdominal viscera, which were sufficient to account for the death of the individual, independently of the displacement of the heart. But the most extraordinary case of this kind on record is that related by M. Deschamps, (Journal Général de Médecine, etc. tom. xxvi. p. 275,) where *the heart was found occupying the place of the left kidney.* The individual in whom this malformation was found was an old soldier who had served several campaigns, and enjoyed excellent health, with the exception of nephritic pains, to which he had then been for some years subject, and on account of which he eventually obtained his discharge from the service. Notwithstanding the frequent recurrence of these pains, he married, and became the father of three children; at length, however, the symptoms of renal disease became more violent, and recurred more frequently; hectic fever set in, and he died after an agony of forty hours; his abdomen covered with large gangrenous spots. On dissection, the right kidney was found very large and in a state of suppuration; the place of the left kidney was occupied by the heart, enveloped in its pericardium. In the thorax, there was no trace of the heart to be found, nor was there any appearance to indicate its ever having been placed there. It is remarkable that this extraordinary displacement of the heart was never discovered or even suspected by the individual or his medical attendants, all the functions of the heart being as effectually and as regularly performed as though it had occupied its natural position within the thorax. It does not appear that there was any malformation of the diaphragm, or indeed of any other part in this instance.

Heart Situated in the Neck.—In M. Breschet's excellent Mémoire on this subject, three cases of this extraordinary malformation, which he proposes to designate *ectopia cordis cephalica*, are related. In one of these cases the heart, lungs, and thymous gland, were all situated in the front of the throat, where they formed a large tumour immediately underneath the lower jaw. The apex of the heart was attached to the base of the tongue, and lay between the rami of the inferior maxilla. The chest was filled with the abdominal viscera, which had passed up through an aperture in the diaphragm. As such complicated malformations are manifestly incompatible with the extra-uterine life of the individual, their description can afford little practical interest to the physician; we shall, therefore, content ourselves with thus briefly noticing the existence of this variety of congenital displacement, and refer the scientific anatomist to the original essay on the subject by M. Breschet.

Without entering at length into the *causes* of the different varieties of congenital malposition of the heart, which would be the more unnecessary as the subject will be fully considered in a separate article on MALFORMATIONS of that organ, we may remark in general terms, that the greater number of these congenital misplacements depend on an arrest of development at a period before the evolution of the fœtus is completed. In this way may be explained the imperfect union of the parietes of the different cavities, and the consequent displacement of the organs usually contained within the thorax and abdomen, their protrusion out of these cavities, &c.; to this cause may also be attributed, with considerable probability at least, the situation of the heart in the neck; as all writers on the development of the embryo are agreed that the heart is situated immediately underneath the head during the first period of the evolution of the fœtus, and that the aorta, instead of forming an arch, descends directly into the chest. It is obvious that if the development of the heart be arrested at this early period, the organ will remain out of the thorax, in the anterior part of the throat, as in the ectopia *cephalica* of Breschet.

We must not, however, suppose that all congenital misplacements of the heart may be thus accounted for, as there are some which evidently result from a perversion of the natural order of development: to this class belong the inclination of the heart's apex to the right, and the total transposition of the organ to that side, accompanied, as it usually is, with a similar transposition of the other viscera. In this way, also, we must explain the situation of the heart in the place of the kidney in the remarkable case recorded by Deschamps, inasmuch as the organ never occupies that position at any period of the evolution of the fœtus, and, *à fortiori*, could not continue to occupy that position in consequence of an arrest of its development; neither was there any malformation or disease of any of the neighbouring viscera to account for the displacement.

II. Displacement of the heart may likewise be occasioned at any period of life by accident or by disease. Displacement from the former cause seldom falls under the observation of the physician, as any accident which is of sufficient violence to force the heart out of its natural situation seldom fails to prove instantaneously fatal. Indeed, the only recorded exception that we are aware of is furnished in the remarkable "case of probable dislocation of the heart from external violence," published by Dr. Stokes in the Edinburgh Medical and Surgical Journal, No. 108, from which we copy the following account:

"Mr. B., æt. 21, had enjoyed uninterrupted health until the 7th of May, 1822, when he was severely crushed between a water-wheel and the embankment on which the axle was supported. He remained for three hours after the accident in a state of complete insensibility. As soon as an examination could be made, the following injuries were discovered. Two ribs in the lower portion of the left side, the right clavicle and humerus, and the fifth, sixth, and seventh ribs on the right side, were broken. The right side of the face and chest was emphysematous, and there was complete paralysis of motion in the right arm, with considerable loss of sensation. *The patient felt great pain in the right side of the chest, with a sensation as if a foreign body preventing respiration had been introduced into the right lung: the pain was accompanied with violent throbbing and heaving, and it was soon discovered that his heart was pulsating at the right side of the sternum.* He had a short dry cough, but experienced no hæmoptysis; *and there was no pain or other symptom of pleuritic inflammation at the left side*,—a point of considerable importance in the diagnosis of the lesion.* From that period to the present his heart has continued to pulsate on the right side of the sternum, the pulsation being generally strong, and aggravated by mental emotion, exercise, or the occurrence of pain in the side. He has never had orthopnœa, but has always experienced great difficulty of breathing on exercise, or when he has attempted to lie on the left side. Since the accident he has every winter experienced several inflammatory attacks, in which he suffers from violent pain of the *right side*, with great increase of palpitation and dyspnœa. These attacks are only relieved by bleeding, and he thinks he has been bled upwards of fifty times. It is a remarkable circumstance that syncope has never been produced even after the loss of so much as thirty ounces of blood at a time, and that he has taken the powder of digitalis in the dose of eight grains every night for the space of three months, without his pulse ever descending below eighty. When he does not take digitalis, his pulse is generally between one hundred and one hundred and twenty, regular in strength and never intermitting; but when he uses that remedy in his ordinary state, the number of respirations is about thirty in the minute. His habit of body is spare but muscular, and the countenance is not expressive of pain. From August to the latter end of April last he shared constantly in the sports of the field: hunting and shooting were his constant employments.

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* We had lately an opportunity, through Dr. Stokes's kindness, of examining this patient, and of ascertaining the accuracy of the above statement. The patient, when interrogated, stated without the least hesitation, that before the accident his heart had always beat at the left side, and that he was himself the first to notice its change of position after that event.

"On stripping the patient and examining his chest carefully, the right shoulder appears depressed, but the right side inferiorly measures an inch in circumference more than the left.

"The *left side* of the thorax sounds perfectly clear, even to its most inferior portion, and in the situation usually occupied by the heart. Respiration of the puerile character, and mixed with some bronchial râles, is to be heard over the entire lung, and is as distinct in the mammary region as in the other portions. Neither the sound nor impulse of the heart is perceptible in the cardiac region. At the *right side* the upper portion of the lung sounds clear, but from the fifth rib downwards there is complete dulness, and here the integuments are exquisitely sensible. In the upper portion, both anteriorly and posteriorly, the respiratory murmur is of the same character as in the opposite lung, but from the fifth rib downward it is wanting; there is no bronchial respiration or resonance of the voice. The pulsations of the heart can be seen and felt in the right mammary region, between the sixth and seventh ribs, and within an inch of the sternum. When not over-excited, the sounds of the heart are almost natural. There is no sign of valvular disease."

That the heart was actually displaced in this case, there can be no doubt whatever; and that the displacement was caused by the external injury is rendered highly probable, from the fact of its being observed for the first time almost immediately after the accident, and from the absence (as ascertained by auscultation and percussion) of all those diseases of the adjacent parts which usually cause the displacement of the heart from the left to the right side.

Besides the causes of displacement already enumerated, viz. congenital malposition, and accident or external injury, the heart is likewise liable to be forced out of its natural situation by various morbid alterations of the adjacent parts.

On studying the anatomical relations of the heart, we perceive that it is retained *in situ* by the large blood-vessels which form its superior attachment,—by the adhesion of the pericardium to the diaphragm, which attaches it inferiorly,—and by the walls of the mediastinum and the equal pressure of the lungs, which oppose its displacement to either side. But as none of those forces which retain the heart in its natural position is of a fixed or unyielding nature, it follows that, whenever a degree of pressure sufficient to overcome their resistance is exerted on the heart by the enlargement or other morbid alteration of any of the surrounding parts, that organ is pressed out of its natural situation, and forced upwards or downwards, to the right or left side, according to the direction in which the pressure is exerted.

The following are the diseases which have been observed most frequently to cause displacement of the heart:

1. **Effusion into the Sac of the Pleura.**—In nine cases out of ten where the heart is removed out of its natural situation, the displacement will be found to have arisen from empyema or pneumothorax; accordingly this displacement is now generally regarded as the most constant and least fallible symptom of these diseases. Of twenty-seven cases of empyema and pneumothorax that have come under the author's observation, in the extensive hospitals attached to the Dublin House of Industry, the heart was perceptibly displaced in *every instance*. Pathologists have long remarked that effusion into the left pleura, by the pressure which it exerts on the parietes of the cavity, as well as on the organs contained within it, is capable of thrusting the heart over to the right side of the sternum; but they do not seem to have been aware that effusion into the right side, by protruding the mediastinum and pressing on the heart, may cause a very considerable displacement of that organ to the left of its natural position. In a case of pleuro-pneumothorax, with fistulous communication through the lung of the right side, which was lately operated upon by Mr. MacDowel, in the Richmond Hospital, the heart was distinctly seen and felt pulsating between the fourth and fifth ribs, near the left axilla, from which situation it gradually returned to its natural position, as the pressure which caused its displacement was removed by drawing off the air and fluid from the opposite side. In all cases of extensive effusion, whether of air or fluid, into the pleura of the right side, we have uniformly observed a similar displacement of the heart proportioned to the extent of the effusion. This displacement of the heart to the left can in some cases only be detected by minute examination, and even in extreme cases is less likely to attract observation than the displacement to the right of the sternum, which seldom fails to arrest the attention of the patient, even though it should be overlooked by his medical attendant. We have already entered at length into the consideration of the value of this symptom as indicative of effusion into the pleura, and shall therefore refer the reader to the article EMPYEMA, where he will find this subject fully considered.

2. **Aneurism of the Aorta.**—When tumours of this kind come in contact with the heart, they seldom fail, as they increase in size, to force it to a greater or less distance from its natural position. Dr. Hope records a case of aneurism of the ascending aorta displacing it to the left. The writer has seen an instance of aneurism of the arch thrusting the heart downwards, so that its apex pulsated in the epigastrium. It is evident from their relative anatomy that aneurism of the thoracic aorta may cause displacement of the heart according to the direction which the sac takes; and Drs. Graves and Stokes have shown that considerable displacement of the central organ of the circulation may be produced by aneurism of the abdominal aorta pressing on the diaphragm and

pericardium. In the interesting case which they have recorded, "the heart was at first found to beat in the epigastrium, the impulse having left the usual situation. In the course of a few days it became feebler in the epigastrium, but could be felt pulsating on the right side, at the sternal end of the fifth rib, and ultimately became fixed in the intercostal space of the third and fourth ribs." (Dublin Hosp. Reports, vol. v. p. 10.)

We may remark that in two cases of aneurism of the ascending aorta which we had lately under our care, the sac presented a double sound at each pulsation: in neither case was there any perceptible displacement of the heart, as the tumour took a direction upwards and to the right side; but in one of the cases which we subsequently had an opportunity of inspecting, we ascertained that the aneurism was in actual contact with the pericardium and heart, from which no doubt it received and transmitted the double pulsation. In two cases related by Drs. Graves and Stokes, (op. cit.) the aneurismal tumour gave a double pulsation; and we believe that a similar phenomenon will be observed whenever the aneurism is so situated as to have the double stroke of the heart mechanically communicated to it.

3. **Tumours.**—Tumours of every description developed in the vicinity of the heart, when they take such a direction and attain so great a size as to press upon that organ, may mechanically displace it. In a young woman who died in the Hardwicke Fever Hospital with symptoms of acute thoracic inflammation, we found on dissection, at which we were assisted by the late Professor Bennet, a large *encephaloid* tumour, which appeared to have originated in the bronchial glands situated at the root of the left lung, and thence to have descended between the pleura and pericardium, thrusting the heart over into the right side, and eventually eating its way by ulceration through the pericardium, where its eruption excited violent inflammation. A similar displacement of the heart, and apparently from a similar cause, was found by Boerhaave on the dissection of the Marquis de St. Auban. (*Zimmermann*, Traité de l'Expérience, tom. iii.)

4. **Pulmonary Emphysema.** — Laennec states, "that when a single lung is affected, it sometimes becomes so much more voluminous than the other as to press aside the heart and mediastinum." (Forbes's Translation, p. 152.) Judging, however, from our own experience, we feel inclined to rank this among the least frequent causes of displacement of the heart, as in most instances where one lung is sufficiently emphysematous to produce such an effect, the other participates in the morbid alteration, and by its increased volume maintains the pressure which the heart sustains in equilibrio: such at least we have found to be the case in the numerous dissections that we have made.

5. **Diaphragmatic Hernia.** — It is evident that when the abdominal viscera are forced into the thorax through an opening in the diaphragm, they may exert such a degree of pressure on the heart as to force it from its natural position. This species of hernia is often congenital, and arises from imperfect development of the diaphragm, in consequence of which an aperture is left, through which several of the abdominal viscera are protruded into the chest by the contraction of the abdominal muscles. We have already recorded examples of congenital ectopia from this cause. It seldom happens that such subjects survive longer than a few hours after birth, in consequence of the obstruction which the respiration encounters. Instances, however, are not wanting of life being prolonged for a considerable period under these apparently hopeless circumstances. In Dr. Wilson's case already quoted, the infant lived some days; but decidedly the most interesting case of this description on record is related by Drs. Graves and Stokes.

"A man about forty years of age died of tubercular phthisis. The œsophagus, after passing through the usual opening in the diaphragm, was found to re-enter the thorax by another very large opening in the tendinous portion towards the left side. The stomach occupied the inferior portion of the left thoracic cavity, its cardiac and pyloric orifices both lying in the opening. A considerable portion of the transverse arch of the colon was also included in the left side of the chest: these viscera, loosely but permanently fixed by means of the serous membranes, all rested on the convex surface of the diaphragm, and *pushed the heart and mediastinum towards the right side.*" (Op. cit. p. 84, 5.) There seems little doubt that the hernia in this case was the result of congenital malformation. Hernia of the abdominal viscera into the thorax, and consequent displacement of the thoracic viscera, has likewise been caused by wounds of the diaphragm, (Essai sur l'Anatomie Pathologique, par J. Cruveilhier,) by rupture of that septum occasioned by a fall; by great exertion, (*Richter*, on Hernia); and, as has been alleged, by enormous distension of the stomach. (*Haller*, Disput. Chirurg. tom. iii.)

6. **Enlargement of the Liver.**—This is also enumerated by authors among the occasional causes of displacement of the heart; we are not, however, acquainted with a well-authenticated instance of the kind. It is probable that a considerable hypertrophy of the left lobe may elevate the diaphragm and displace the heart; the same effect may likewise be produced by excessive enlargement of the spleen, or by the development of any morbid growth in the epigastrium or left hypochondrium.

7. **Hypertrophy with Dilatation of the Heart.**—When the heart is enlarged, its apex is carried to the left, and its basis to the right side, in such a manner that it lies almost transversely across the chest. This observation, originally, we believe, made by M. Bertin, (Traité des Maladies du Cœur, pl. 2me.) has been repeatedly verified by the writer. It has also been remarked by Bertin that in those cases where the size and weight of the heart are very considerably augmented, the organ presses with all its weight on the diaphragm, so that that portion of the septum on which it reposes is thrust before it like a pouch in the abdomen. Sometimes this depression has been known to take place without any visible cause, in which case the affection has received the name of *prolapsus* of the heart. (*Laennec*, op. cit. p. 615.) Some authors have thought that this prolapsus might be caused by relaxation of

the vessels, by which the heart is as it were suspended in situ. (*Bertin*, op. cit. p. 442.) We think it more probable, however, that the displacement in such cases must have been more apparent than real, as we know from experience that the heart's pulsation may be felt in the epigastrium in a great many persons, particularly when the sternum is short, although the heart retains its natural position.

Diagnosis and Treatment.—Displacements of the heart are now easily detected by the aid of auscultation and percussion: the disappearance of the usual phenomena of the heart's action from the cardiac region, and their appearance in another and different situation, afford unerring evidence of a corresponding change in the position of the organ. As, however, the changes of position which the heart undergoes are, in every instance almost, the effect of more serious organic lesions, their diagnosis becomes a matter of very secondary importance, as compared with that of the disease by which they were caused, and of which they should properly be regarded as a symptom. Indeed, the principal advantage, in a practical point of view, of detecting a displacement of the heart, is derived from the light which it throws on the nature, extent, and situation of the primary disease by which it was produced, and on which the danger of the displacement, as well as its appropriate treatment, in a great measure depends. It is, therefore, to the accurate diagnosis of the cause of the displacement that the scientific physician will chiefly direct his attention; these causes we have already enumerated, and we beg to refer the reader to the respective articles which treat of the particular diseases, for such diagnostic characters as may enable him to decide in any doubtful case the true cause of the displacement.

From the circumstance of displacement of the heart being so constantly combined with other and more serious lesions, it is extremely difficult to ascertain the effects on the system resulting from the simple displacement. In *congenital malpositions* the alteration in the heart's place is usually coupled with other malformations of a more serious character, which either cut short the life of the individual, or else complicate the symptoms of the displacement in such a way that it is impossible to analyze them correctly. In those rare cases where the displacement of the heart was the principal or only deviation from the natural arrangements of parts, little or no inconvenience seems to have resulted from it. In Ramel's case already quoted, where the heart was situated below the diaphragm, the individual experienced no inconvenience during infancy; as she grew up she occasionally suffered from palpitations and dyspnœa, and at the age of twelve she is represented to have enjoyed as good health as other people. M. Deschamp's case affords a still more remarkable example of the absence of any distressing symptoms from the displacement, though the heart was situated in the place of the left kidney. In this case the great vessels were disposed in the most favourable manner for transmitting the blood from the heart; but when the displacement is caused by accident or disease, the large vessels are necessarily contorted more or less, in order to accommodate themselves to the new position of the heart; and if to this we add the pressure and consequent obstruction to the due discharge of their functions which the parts that the heart is forced amongst necessarily sustain, we shall see sufficient reason for concluding that the consequences must be most serious and detrimental when the displacement is at all considerable; but even to those untoward circumstances the powers of nature are capable of adapting themselves. In Dr. Stokes's case the patient, though occasionally subject to palpitations *in the right side*, has so much improved in health as to spend his time between shooting and fox-hunting. In all cases of displacement that we have seen, the pulse was rapid and feeble, and the patient suffered from occasional attacks of dyspnœa and palpitation; but in each of these cases the displacement was complicated with empyema or pneumothorax, either of which was of itself sufficient to produce these symptoms. In general, however, we observed that they were immediately relieved by drawing off the fluid, and allowing the heart to resume its natural position. We are, therefore, disposed to conclude that slight displacements occasion little inconvenience, but when considerable they may produce serious functional derangements, especially until such time as the system has become habituated to the change.

The treatment of displacement of the heart must obviously depend on its cause; where that is of such a nature as to admit of removal, no sooner is its pressure taken off than the heart resumes its natural position, unless retained by morbid adhesions. When, on the other hand, the cause of the displacement does not admit of removal, the replacement of the heart is impracticable; and all that the resources of our art can effect is to palliate symptoms as they arise. In all our attempts, therefore, either to restore the heart to its natural position, or to mitigate the symptoms which its displacement produces, we should ever bear in mind that we are only treating a symptom — a mere mechanical effect of pressure; and that, by relieving the primary disease which caused the pressure, we take the most effectual method of remedying the displacement it produces.

On referring to the list of diseases we have enumerated among the causes of displacement, it will appear that many of them, such as aneurisms of the aorta, tumours developed within the thorax, &c. are of such a nature as not to admit of removal or diminution. Congenital malposition is equally irremediable: even in those cases where the heart was placed in front of the chest, immediately under the integuments, it was found that the attempt to force it into the thorax through the fissure in the sternum immediately brought on the most alarming symptoms. (*Breschet*, Mém. cit.) In all such cases our best resource lies in the palliative treatment. The patient should be kept as quiet as possible, and every other precaution adopted to prevent the circulation being excited. When palpitations are troublesome, digitalis may be administered with advantage; its exhibition, however, requires considerable attention, as it has been observed not to produce its effects in such cases unless administered in full doses, and we have witnessed the most alarming consequences from its over-action. Counter-irritation may likewise be employed with advantage; we have repeatedly found blisters applied over the heart most efficacious in controlling this symptom: when a more permanent effect is desirable, a seton may be introduced in the side near the heart. Dr. Stokes's patient, when we last saw him, declared that he experienced the most decided relief after the introduction of a seton into his right side, and that on one occasion when he withdrew it for a fortnight he was attacked with his former symptoms of pain and palpitation, which again disappeared after the seton had been introduced.

We have already stated our opinion that effusions into the pleura are decidedly the most frequent cause of displacement of the heart. By the operation of paracentesis thoracis, these may no doubt be removed; but in deciding on the expediency of this operation there are many circumstances of greater importance than the displacement, which the physician must take into consideration. (See EMPYEMA.)

In the case of diaphragmatic hernia, Laennec suggests the idea of making an incision into the abdomen and drawing back the intestines. We conceive that if such an operation could ever be justifiable, it would only be when the pressure of the abdominal viscera on the lungs threatened immediate suffocation, in which case a doubtful remedy might perhaps be preferred to none: but how are the intestines to be prevented from again returning into the chest through the aperture in the diaphragm?

R. TOWNSEND.

HEART, (FATTY AND GREASY DEGENERATIONS OF) — In individuals of great obesity, and occasionally in others of only moderate *embonpoint*, the heart is sometimes overloaden with fat. It is deposited beneath the pericardium, and not only invests the organ externally, but frequently penetrates a considerable depth between the muscular fibres, which, as if losing (probably by the pressure) what the adipose tissue gains, become attenuated and flabby. Sometimes, however, the intermixture of adipose matter gives the appearance of attenuation, though there is none in reality.

The old authors imagined that this affection was the cause of more or less severe symptoms, and even of sudden death. Corvisart thinks that an enormous accumulation might sometimes be capable of producing such an effect; but, in the persons in whom he had met with very fat hearts, he had seen nothing which could prove to him "that the state was morbid, that is to say, carried to such a point as constantly to derange the function of the organ, and thus constitute a malady." The experience of Laennec has led him to the same conclusions; nor have we seen any thing that militates against them.

It would be natural to suppose that the substitution of adipose for muscular tissue, and the extreme attenuation which the walls, especially the apex and the posterior part of the right ventricle, sometimes undergo from this cause, would be eminently favourable to rupture of the organ; yet this accident is very rarely the result. Morgagni has seen an instance of it, but Bertin has only met with one of rupture of the auricle; while Corvisart and Laennec have not witnessed an instance at all.

Fatty degeneration is different from that denominated *greasy* degeneration of the heart. This, according to Laennec, is "an infiltration of the muscular substance with a matter which presents all the physical and chemical properties of grease; it is an alteration exactly similar to the greasy degeneration which Haller and Vicq-d'Azyr have observed in the muscles. Laennec has never found it but in a very small portion of the heart, and only near the point. It was of a pale yellowish colour, like dead leaves, and therefore very similar to certain varieties of softening; but he thinks that it may be distinguished from softening by its strongly greasing paper between which it is pressed. We have seen a remarkable case in which a degeneration of this kind occupied the greater part of both ventricles.

J. HOPE.

HEART, (HYPERTROPHY OF THE) — In this article we propose to develope, with as much brevity as the importance of the subject will allow, many of the leading principles common to organic diseases of the heart in general.

Hypertrophy of the heart is an augmentation of its muscular substance, resulting from increased nutrition. The terms *active* and *passive aneurism of the heart* we discard as vague and inaccurate, and adopt the following classification and nomenclature.

1. *Simple hypertrophy*, in which the walls are thickened, the cavity retaining its natural dimensions.

2. *Hypertrophy with dilatation*. This, the eccentric or aneurismal hypertrophy of Bertin, presents two varieties: viz.—

a. With the walls thickened and the cavity dilated.

b. With the walls of natural thickness and the cavity dilated: i. e. *hypertrophy by increased extent of the walls.*

3. *Hypertrophy with contraction*. In this, the concentric hypertrophy of Bertin, the walls are thickened and the cavity is diminished. This classification is no less convenient than conformable to nature. The form of the second variety was not known to Laennec, though it was to Bertin. That it *really* consists of an augmentation of muscular substance, and therefore constitutes hypertrophy, is too manifest to require comment; but a further proof than mere structure affords is that it sometimes produces the symptoms of hypertrophy,—a fact which the writer ascertained and made known several years ago, before he had any knowledge that M. Bertin had done the same. (Vide an Essay by the writer in 1824, read to the Royal Med. Soc. Ed.)

The terms "eccentric or aneurismal" and "concentric" are not so simple and expressive as hypertrophy with dilatation, introduced by Laennec, and its natural converse, hypertrophy with contraction. There is a further objection to the nomenclature of Bertin. His first variety of dilatation, identical in its nature with his second variety of hypertrophy, is designated by a totally different name, viz. active aneurism (*Bertin*, p. 376), which could scarcely fail to lead the inexperienced student into the erroneous idea that there was a difference in the nature of the two affections. Now the only difference consists in degree—in a predominance of the one state over the other. The terms, therefore, should be such as distinctly to imply identity in nature, and difference in degree only: and this is done in the simplest manner by giving precedence to the word hypertrophy, or dilatation, according as the one affection or the other predominates. Thus hypertrophy with dilatation denotes a predominance of hypertrophy, while the converse, dilatation with thickening (see DILATATION), denotes a predominance of dilatation. Hypertrophy by increased extent (without altered thickness) of the walls,—the form *b.* of the second variety,—is thus designated when it is accompanied with the symptoms of hypertrophy; but it is called simple dilatation when the symptoms are those of dilatation.

We have thought it necessary to speak thus particularly on the subject of nomenclature, as up to the present moment it has created much confusion, and must continue to do so until the terms active and passive aneurism are forgotten.

Anatomical Characters of Hypertrophy of the Heart.—Before describing the anatomical characters of hypertrophy of the heart, it is necessary to give the reader an idea of the natural dimensions of the organ. Unfortunately, it is impossible to determine these exactly; for as they vary according to age, sex, and other circumstances, there is no immutable standard of comparison which might serve as a criterion. It is only by the eye, therefore, (and an experienced eye is necessary for the purpose,) that it can be determined whether the proportion of the heart to the system, and of its several parts to each other, is natural. The proportions assigned by Laennec approach perhaps as near the truth as it is possible to arrive: they are as follows. "The heart, comprising the auricles, ought to have a size equal to, a little less, or a very little larger than the fist of the subject. The walls of the left ventricle ought to have a thickness a little more than double that of the walls of the right: they ought not to collapse when an incision is made into the cavity. The right ventricle, a little larger than the left, and having larger columnæ carneæ, notwithstanding the inferior thickness of its walls, ought to collapse after an incision has been made into it. Reason indicates and observation proves that in a sound and well-built subject the four cavities of the heart are, within very little, equal to each other. But as the walls of the auricles are very thin, and those of the ventricles have considerable thickness, it results that the auricles form scarcely a third of the total volume of the organ, or the half of that of the ventricles." In the fœtus and very young children, the thickness of the left ventricle does not exceed that of the right to the extent described. The right cavities are rather larger than the left, and this is not owing to sanguineous distension attendant on dissolution; for the disparity is found, though in a less degree, in animals destroyed by hemorrhage.

[In another work (*Human Physiology*, 5th edit. ii. 73, Philad. 1844) the writer has given the dimensions of the heart after various observers. (See, also, Dr. Pennock's edit. of Hope on *Diseases of the Heart*, p. 233.) Of late M. Ranking (*Lon. Med. Gazette*, No. xxiv., 1842) has published the results of measurements, evidently made with accuracy, of upwards of 100 hearts, care being taken to exclude all those that exhibited any trace of organic change. The following were the mean admeasurement of 15 male hearts; the *mean circumference* was $9\frac{27}{48}$ inches; of 17 female hearts, $8\frac{16}{48}$ inches. The *mean length* of the male heart was $4\frac{16}{48}$ inches; of the female, $4\frac{36}{48}$. The *mean thickness* of the left ventricle in the male was $\frac{27}{48}$ths of an inch; in the female, $\frac{23}{48}$ths; of the right ventricle in the male $\frac{8}{48}$ths; in the female, $\frac{6}{48}$ths. The septum ventriculorum has, in the male, a mean thickness of $\frac{22}{48}$ths of an inch; in the female, $\frac{14}{48}$ths. The entire orifice in the male had a mean circumference of $2\frac{34}{48}$ths inches; the right auriculo-ventricular orifice $4\frac{35}{48}$ths inches; the left auriculo-ventricular orifice $3\frac{45}{48}$ inches. The corresponding parts, in the female, were relatively less. The inferences, drawn by Dr. Ranking from all his observations, are, that the length of the healthy heart to its circumference is rather less than 1 to 2;—that the thickness of the parietes of the right ventricle is to that of the left as 1 to 3 nearly;—that the pulmonary artery is slightly wider than the aorta; and lastly, that the right auriculo-ventricular opening is considerably larger than the left.]

The muscular substance in hypertrophy is usually firmer and redder than natural. These characters, however, are not essential to the disease; and when they exist in a great degree, they constitute induration, a distinct affection, dependent, not on increased, but rather on altered nutrition of the part.

Hypertrophy may be confined to a single cavity, or it may affect several, and even the whole simultaneously; and sometimes one cavity is thickened while another is attenuated. The reasons of this will be explained when we come to treat of the exciting causes. When all the cavities are hypertrophous, and at the same time dilated, the heart attains a volume, two, three, and occasionally even four times greater than natural; its form, instead of being oblong, is spherical; its apex is scarcely distinguishable; and as the diaphragm does not retire sufficiently to yield space downwards for the enlarged organ, it assumes an unnaturally horizontal position, encroaching so far upon the left cavity of the chest, as sometimes to force the lungs upwards as high as the level of the fourth rib, or even higher. When great enlargement is accompanied by adhesion of the pericardium, the organ is secured by the attachments of the membrane in a higher situation than its gravity would otherwise dispose it to assume; and being thus impacted between the spine and the anterior parietes of the chest, it is apt to occasion a preternatural prominence of the præcordial region. We are not aware that this remark has been made by any other writer, but we have seen the phenomenon in so many instances, that we are disposed to assume it as a general fact. (See PERICARDITIS.)

The left ventricle, being more prone to thickening, and not less to dilatation than the right, sometimes attains a volume seldom or never acquired by the right; and when its enlargement is enormous, it occupies not only the left præcordial region, but extends far under the sternum, where its impulse and sound may be mistaken for those of the right ventricle. (*Laennec*, tom. ii. p. 507. Treatise on Disease of Heart, by Dr. Hope: case of Lambert.)

The walls of the left ventricle, the natural thickness of which averages about half an inch in the adult, may be increased to the extent of one, one and a half, or, according to some, of two inches. The cases are rare in which it exceeds an inch and a quarter. The situation of the greatest thickening is usually a little above the middle of the ventricle, where the columnæ carneæ take their origin. Thence, the thickness decreases rather suddenly towards the aortic orifice, and gradually towards the apex, where it is reduced to less than half. When hypertrophy maintains these proportions in the different parts of the ventricle, the state is only an exaggeration of the natural form. The case is different when the hypertrophy takes place inwards and diminishes the cavity; for then the whole ventricle is nearly equally thickened, and it is usually globular and firm.

The columnæ carneæ generally participate in hypertrophy, but sometimes, when there is much coexistent dilatation, they appear to be stretched, flattened, and attenuated. The inter-ventricular septum, though belonging almost entirely to the left ventricle, is commonly less thickened than the external walls of this cavity. When the left ventricle is greatly enlarged, the right, if unchanged, is applied in a flattened form to its superior and lateral part, and by contrast looks singularly small. But if, as generally happens, the right is elongated, it is, as it were, folded around the left.

When the right ventricle alone is hypertrophous, it may descend lower than the left, and constitute the apex of the heart. Its columnæ carneæ, naturally more numerous and interwoven than those of the left, are more susceptible of thickening than the walls themselves. Hence the increased size of the columnæ is commonly the first object that arrests the attention, and to them alone is the hypertrophy in many instances confined. They are sometimes so curiously interlaced and attached as to traverse the ventricle in every direction, subdivide it into various compartments, and in some cases almost totally to fill up its cavity: (as in case 89 by Bertin, and that of Collins, p. 469 of Treatise of Dr. Hope.) These changes never take place to the same extent in the left ventricle. The total thickness of the walls of the right ventricle, naturally averaging three lines, rarely exceeds four or five; yet it has been known to attain from eleven to sixteen, as appears from the 88th case of Bertin, and one, by Soins, in the *Archives de Médecine*. In a girl of nine years old we have met with it measuring six or seven lines, which is equal in proportion to nearly double that extent in the adult. Hypertrophy without dilatation is much more rare in the right than in the left ventricle. The greatest thickening of the right ventricle is near its base: towards the apex, though the columnæ carneæ be enlarged, their interstices are usually thin, and not unfrequently translucent.

Hypertrophy may not only be confined to a single ventricle, whether the right or the left, but it may be limited to particular parts only, as the base, the septum, the apex, the columnæ carneæ, or the external walls; the remainder of the cavity being either natural or attenuated. Again, a thickened ventricle may be contracted in one part, while it is dilated in another. In examining the dead subject in mixed cases, it is necessary to counterpoise the opposite conditions, to balance the hypertrophy against the attenuation, and the dilatation against the contraction, in order to determine which is the predominant affection.

The hypertrophy of the auricles is almost invariably of the second species, or that with dilatation. Laennec even states that he has never met with any other. (De l'Auscult. tom. ii. p. 524.) The simple and the contracted forms, however, are not without example. The thickening is diffused in a very uniform manner throughout the cavities, the musculi pectinati being the only parts in which it is more considerable than elsewhere; and as they are larger and more numerous in the right than in the left auricle, it is in the former that hypertrophy proceeds to the greatest extent. It occasionally renders the auricle nearly as thick as the right ventricle. This we have never known to take place in the left auricle. Sometimes the musculi pectinati are the only parts in which hypertrophy shows itself. The thickening of the auricular walls seldom exceeds double the natural state, and being even then inconsiderable, it may easily be overlooked by an inexperienced eye. When it amounts to a quarter of an inch, which is rarely the case, it is very perceptible.

Mode of Formation and Predisposing Causes of Hypertrophy.—Hypertrophy takes place in the heart by the same process as in any other muscle. Increased action causes an augmented afflux of blood, and there results a corresponding increase of nutrition. Diminished action, on the contrary, has the reverse effect. Thus, the arms of the smith and the legs of the dancer are usually robust; while limbs paralysed or not exercised are pale and emaciated. If, however, the circulation can be re-invigorated in the palsied part, nutrition is increased.

In the same way, when from mechanical obstruction or any other cause blood is inordinately accumulated in the heart,—short, however, of that degree which would paralyse its remittent power—the organ is provoked to extraordinary efforts; it struggles against the obstacle; it frets and labours to overcome it; the coronary arteries are excited to increased activity; augmented nutrition ensues; the parietes are thickened, the muscular power is increased; the effects, superadded to the cause, induce a still greater violence of action; and thus the disease is not only established, but has a constant tendency to increase.

The left ventricle is much more prone to hypertrophy than the right;* and the right, again, than the auricles. This admits of explanation on very simple principles. It is found that hollow muscles resist over-distension by their contents with a force exactly proportionate to their strength. Thus, if we suppose two cavities, one twice the strength of the other, and add to the natural pressure on those cavities such a surplus as will exactly overpower

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* [This is the general opinion, but M. Louis affirms, that of 49 cases of hypertrophy of the ventricles, 29 were of the right ventricle.]

the weaker, this surplus will bring into action only one half of the supplementary strength of the more vigorous. Now, as the act of resistance, by stimulating the arteries to increased action, is the cause of increased nutrition, it follows that stronger muscles must be the more susceptible of hypertrophy. Accordingly, on referring to the heart, we find that the relative structure of its several compartments is such as to predispose the organ to those changes which it actually undergoes from over-distension. The left ventricle, being charged with the immense burden of the greater circulation, is proportionably substantial and robust; the right, having the comparatively light task of propelling the blood through the minor or pulmonary system, is little more than one-third as thick and powerful as the left: the auricles, again, having a still less laborious function to perform, have a still more limited muscular provision. Hence, it is easily understood how a given increase of distending force, sufficient to overcome the contractile and elastic power of the right ventricle, might operate merely as a stimulus to the superior muscularity of the left. While the former, therefore, incapable of re-acting on its contents, would dilate, the latter, excited to extraordinary efforts, would become hypertrophous.

It is not however to be supposed, that while the left ventricle is becoming hypertrophous, it may not at the same time undergo dilatation; nor, on the other hand, that the right ventricle, while yielding to dilatation, may not become hypertrophous; for observation teaches us that the combination of hypertrophy with dilatation, either in the left ventricle alone, or in the two conjointly, is the most ordinary form of organic disease of the heart.

For an explanation of the cause why dilatation accompanies hypertrophy, the reader may refer to the article on Dilatation. Why hypertrophy sometimes accompanies dilatation of the right ventricle may be here explained, and it admits of an explanation in one or other of two ways. 1. It has been remarked by Laennec (Traité, tom. ii. p. 496,) that a large proportion of mankind are born with ill-proportioned hearts, the parietes being a little too thin or a little too thick on one or both sides. Now when this abnormal thickness exists in the right ventricle, it is clear, from what has been said above, that it must impart to that ventricle an increased disposition to hypertrophy. This explanation, however, is not satisfactory, as the existence of the malformation described by Laennec cannot be positively proved: still, as all the other organs and parts of the body are liable to defects of natural conformation, it is consistent with analogy to suppose that the heart may be liable to them also.

2. As augmented nutrition is excited in the left ventricle by stimulating it in proportion to and not beyond its power, so a stimulus bearing the same proportion to the power of the right ventricle, must have the same effect on it also. Accordingly, in the majority of cases of hypertrophy of the right ventricle, an obstacle is found to exist of such a nature as to stimulate it in the manner described. The obstacles which we have most frequently found to produce the effect, are, contraction of the mitral valve operating in a retrograde direction through the lungs, and that of the semilunar valves of the pulmonary artery. These affections being usually slight at their commencement and slow in their progress, oppose an obstacle to the circulation not only moderate in degree, but constant in its operation,—the two circumstances best calculated to induce hypertrophy of the right ventricle.

M. Bertin conceives that the greater tendency of the left ventricle than of the right to hypertrophy, depends upon the more stimulant quality of the arterial blood circulating through the former. This opinion he founds on the circumstance that hypertrophy of the right ventricle in most cases accompanies patescence of the foramen ovale, which lesion he thinks causes an influx of arterial blood into the right ventricle. But, admitting that arterial blood in the right ventricle does occasion hypertrophy, it does not follow that it should have the same effect on the left; for of the former ventricle it is a morbid stimulus, but of the latter it is the natural one. Accordingly, direct proof is to be found in the auricles, that arterial blood is not the cause of hypertrophy; for the left auricle, which on M. Bertin's principle ought to be more subject to hypertrophy than the right, is less so. It will be shown, moreover, in the article on malformations of the heart, that, in the cases on which M. Bertin founds his opinion, the blood does not enter the right ventricle.

Exciting Causes.—According to the foregoing opinions on the mode of formation of hypertrophy, it will be apparent that every circumstance capable of increasing the action of the heart for a sufficient length of time,—a period which must be very considerable,—may be a cause of hypertrophy. These circumstances may be either, 1. of a nervous, or 2. of a mechanical nature. 1. The former class comprises all moral affections and all derangements of the nervous function that excite long continued palpitation. To these we would add protracted rheumatic fevers; for we have known these give rise to hypertrophy, though there was apparently no inflammation of the heart or its membranes. 2. The latter class embraces all physical causes which can either *accelerate* or *obstruct* the circulation, and thus occasion a preternatural pressure of the blood upon the heart. The physical causes which *accelerate* the circulation, are, violent and protracted corporeal efforts of every description. In growing youths, excessive rowing is one of the most efficient. We have met with several in which it has produced the effect. The physical causes which *obstruct* the circulation are very numerous. They comprise smallness of the aorta, whether congenital or acquired: dilatation of the aorta; inequalities of its internal surface; all diseases of the valves of the heart which either contract their apertures or impede their movements; adhesion of the pericardium; all affections of the chest that obstruct the circulation through the lungs, as peripneumony, acute or chronic; empyema; hydrothorax; chronic catarrh; emphysema; phthisis;[*] narrowness of the chest, either congenital, or occasioned by curvature[*] of the spine, &c.; encroachment of the diaphragm on the cavity of the chest from the pressure of tight stays, of the gravid uterus, of abdominal dropsy, aneurism, &c.

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[*] We have not found that phthisis is so decided a cause of disease of the heart as we should be led to suppose from the extreme pulmonary obstruction to which it sometimes gives rise. The reason of this appears to be, that, in the early stages, when the disorganization is not extensive, the circulation is little embarrassed; and in

In reference both to the nervous and the physical causes of palpitation, it may be said that young persons of a plethoric habit and sanguine temperament are the most susceptible of their influence. Hence it is that very stout and high-coloured females, from the age of seventeen to twenty-five, are peculiarly subject to hypertrophy. We have noticed this fact more especially in servants coming to London from the country.

Order of succession in which the several compartments of the heart are rendered hypertrophous by an obstacle before them in the course of the circulation.—As an obstacle to the circulation operates on the heart in a retrograde direction, the cavity situated immediately behind it is the first to suffer from its influence. Accordingly all the impediments seated in the aorta, its mouth, or the arterial system, act primarily on the left ventricle, which, being likewise exposed to the heaviest burden when the circulation is accelerated, has to conflict against a greater variety of exciting causes of hypertrophy than any other cavity of the heart. On this account, therefore, as well as from the thickness of its parietes, it is subject to hypertrophy in a greater degree than any other.

So long as the left ventricle is capable of propelling its contents, the corresponding auricle, being protected by its valve, remains secure. Hence, in a large majority of cases, the auricle is perfectly exempt from disease, while the ventricle is even enormously thickened and dilated. But when the distending pressure of the blood preponderates over the power of the ventricle, its contents, not being duly expelled, constitute an obstacle to the transmission of the auricular blood. Hence the auricle becomes over-distended, and the obstruction may be propagated backwards through the lungs to the right side of the heart, and there occasion the same series of phenomena. When the obstruction thus becomes universal, as is frequently the case, it may happen either that all the cavities are thickened, or those only which from their conformation have the greatest predisposition to it.

When the mitral orifice is contracted, especially if the aperture be very small, the left ventricle, being insufficiently supplied with blood, is not stimulated to its ordinary contractile action, and consequently becomes emaciated and occasionally flaccid or softened. Meanwhile, the left auricle, having to struggle against the contracted valve in front, and also to sustain the distended pressure of the blood flowing in from the lungs, invariably becomes thickened and dilated. The engorgement, extending backwards through the lungs to the right ventricle, occasions its hypertrophy and dilatation; under which circumstances, namely, hypertrophy of the right ventricle and contraction of the mitral valve, the lungs suffer in a pre-eminent degree; for being exposed to the augmented impulsive power of the right ventricle behind, and incapable of unloading themselves on account of the straitened orifice in front, their delicate and ill-supported vessels are strained beyond the power of resistance. If, therefore, they cannot disgorge themselves sufficiently by a copious secretion of watery mucus, they effuse blood by transudation into the air-vesicles and tubes, and form the disease denominated *pulmonary apoplexy*. We have found this affection to occur more frequently under the circumstances described than under any other.

When the mitral orifice is permanently patescent, so that, at each ventricular contraction, blood regurgitates into the auricle, this cavity suffers in a remarkable degree; for it is not only gorged with the blood which it cannot transmit, but, in addition, sustains the pressure of the ventricular contraction. Permanent patescence of the mitral orifice, therefore, constitutes an obstruction on the left side of the heart, and the effect of this, as of contraction of the orifice, may be propagated backwards to the right side.

When the impediment to the circulation is primitively seated in the lungs, the right ventricle, situated immediately behind them, is the first to experience its influence; and when the cavity is so far overpowered by the distending pressure of the blood as to be incapable of adequately expelling its contents, the obstruction extends to the auricle; the process being exactly the same as that already described in reference to the left ventricle and auricle.

Obstruction in the right auricle, whether from this or any other cause, presents an obstacle to the return of the venous blood, and therefore ultimately causes retardation throughout the whole venous system. Nor is this all; for the retardation is propagated through the capillaries to the arterial system, and thus at length returns in a circle to the heart. In this way is explained what at first sight appears an anomaly; namely, that the left cavities are sometimes rendered hypertrophous by an obstruction situated behind them in the course of the circulation. The left ventricle, for instance, may be rendered hypertrophous by a contraction of the mitral orifice.

The reader must here be again reminded that the exciting causes of hypertrophy are equally those of dilatation, and that, supposing no unknown agencies to interfere, as may sometimes possibly happen, it depends on the proportion which the exciting cause bears to the re-acting energy of the cavity exposed to its influence, whether that cavity become affected with hypertrophy, with dilatation, or with a combination of the two.

It may be said, generally, that when congestion is *constant* in a cavity, dilatation is more commonly the result; and that when there is only resistance to the expulsion of the blood, without constant engorgement of the cavity, it is more common for hypertrophy to be produced. Contraction, for instance, of the aortic orifice causes hypertrophy of the left ventricle in a greater degree than dilatation; whereas patescence of that orifice, attended with regurgigation and constant

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the advanced stages, the mass of circulating fluids is so much diminished in consequence of deficient nutrition and augmented cutaneous transpiration, that the heart sustains little additional burden from the obstruction in the lungs. In most cases, however, the right ventricle is found somewhat dilated,—a remark which has been made more especially by M. Louis and Dr. Williams.

[*] The majority of humpbacked persons are ultimately attacked by disease of the heart.

engorgement of the cavity, causes dilatation in a greater degree than hypertrophy.

Hypertrophy with contraction most commonly proceeds from straitening of an orifice. Thus the greatest hypertrophy with contraction of the right ventricle upon record was accompanied with straitening of the pulmonary orifice to two lines in diameter. (Case 87 by M. Bertin.) We have met with a very similar case; and several connected with malformation of the heart are on record.

It may be useful to subjoin a list of the various forms and combinations of hypertrophy and dilatation, and to show the comparative frequency of their occurrence. On the latter point we shall offer the result of our own observation, and we believe that they correspond very closely with those of others.

The diseases are of more frequent occurrence in proportion as they are higher in the following scale.

1. Hypertrophy, with dilatation of the left ventricle, and a less degree of the same in the right.
2. Hypertrophy, with dilatation of one ventricle, especially the left, with simple dilatation of the other.
3. Simple dilatation of both ventricles.
4. Simple hypertrophy of the left, and hypertrophy with dilatation of the right.
5. Dilatation with attenuation of the left.
6. Hypertrophy with contraction of the left.
7. Hypertrophy with contraction of the right.

Of the Auricles.— 1. Distension, particularly of the right, from congestion during the act of dissolution.

2. Dilatation with hypertrophy.
3. Simple hypertrophy.
4. Hypertrophy with contraction.

Pathological effects of Hypertrophy, and mode of their Production.—M. Laennec supposes the general symptoms of all organic diseases of the heart to be nearly the same. (De l'Auscult. tom. ii. p. 487.) It may be said without prejudice to one who has done so much, that, on this subject, both he and all the authors who preceded him have entertained inaccurate ideas. They had studied these diseases in the aspect under which they most commonly present themselves, namely, complicated one with another; and it is unquestionable that when so viewed, they display a great similarity in their symptoms. But it had never occurred to those authors to analyze each disease in an isolated form. When so examined, although certain symptoms are common to all, they severally manifest differences of a striking kind, obviously dependent on their respective organic peculiarities, and which may, therefore, be fairly regarded as the essential and diagnostic characters of each.

M. Bertin has the merit of having been the first to display in a clear light the essential pathology of hypertrophy. His distinguished talent for generalization, however, has, we believe it will be allowed, carried him too far. He contends that authors are wrong in having assigned to hypertrophy or *active aneurism* as its symptoms, dyspnœa, suffocation, violet injection of the face, engorgement of the lips and of the venous capillaries in general, passive hemorrhages, and serous infiltration. He contends that these are the signs, not of hypertrophy, but of some coexistent lesion, as a contracted orifice or any other affection capable of obstructing the circulation; and that pure uncomplicated hypertrophy is characterized by signs of increased activity and energy of the circulation, instead of by dropsy and the other signs of retardation of the blood.

That this is true in reference to the *pure uncomplicated* form of the disease, before embarrassment of the capillary circulation has taken place, will not be denied by any one who has had opportunities of verifying the symptoms by dissection. But M. Bertin is not, in our opinion, supported by sound observation when he says that serous infiltration and the whole class of symptoms bespeaking an obstructed circulation, are totally foreign and repugnant to hypertrophy. The truth we believe to be, that the very same energy of the circulation which gives rise to active hemorrhages, apoplexy, &c., causes, as its next effect, engorgement of the arterial capillary system; the necessary consequence of which is serous infiltration, and more or less of all the other symptoms indicative of retardation of the blood.

M. Bertin is of opinion that the impediment to the respiration which attends enormous enlargement of the heart, results from the encroachment of the organ on the lungs. This, however, is disproved by the fact that tumours of a much larger size, as for instance, aneurisms of the aorta, malignant tumours, &c. have existed in the chest, even for years, without producing similar inconvenience.

The primary effect of universal obstruction of the lungs by engorgement resulting from hypertrophy of the heart, is, to produce œdema of their cellular tissue and dyspnœa. The secondary effect is, to gorge the right side of the heart, and thus impede the return of the venous blood from the system at large; which impediment co-operates with the increased energy of the arterial circulation in producing anasarca.

Hypertrophy, however, does not produce serous infiltration so readily and promptly as a direct, primary obstacle to the return of the venous blood, —a fact which admits of a rational and obvious explanation. When there is an obstacle to the return of the venous blood, suppose, for instance, contraction of the tricuspid orifice, two causes conspire to produce the capillary congestion; namely, the direct pressure of the arterial vis-a-tergo, and the retrograde pressure of the retarded venous blood. But when the latter pressure does not exist, when the veins freely receive and transmit their natural proportion of blood, the force of the arterial circulation must be *very greatly* increased, before it can so far overcome the elasticity of the capillaries as to give rise to engorgement and infiltration.

This satisfactorily accounts for the difference in the history and character of infiltration as resulting, on the one hand, from pure hypertrophy, and on the other from contraction of a valve or other primary obstacle to the circulation. In the former case, it appears late, is generally moderate in extent, and requires for its production an aggravated form of hypertrophy; in the latter case, it appears comparatively early, is more copious, and yields with less facility to remedies.

The same reasons that account for the tardy occurrence of dropsy in pure hypertrophy, account, likewise, for another characteristic of this malady when moderate in degree; namely, the slight and transitory nature of the attacks of dyspnœa. For if the quantity of blood impelled into the lungs by the right ventricle, and the force with which it is impelled, are not very excessive, the pulmonary veins are capable of relieving the engorgement almost as quickly as it takes place: consequently the hurry of the respiration subsides promptly after the removal of its exciting cause; in other words, as soon as the action of the heart becomes a little calm. The sum, then, of all that has been said, is, that pure hypertrophy gives rise to increased force and activity of the circulation, and that, when this force surmounts the natural tonic power of the capillaries, congestion, infiltration, and the other phenomena of an obstructed circulation, ensue.

To these principles an exception presents itself in hypertrophy with contraction, whenever the cavity of the ventricle is too small to be capable of transmitting the natural quantity of blood. In this case, supposing the left ventricle to be the one affected, the arterial circulation sustains a diminution of force and activity; and whether the one ventricle or the other be affected, the disease creates an obstruction tantamount to that produced by valvular contraction: on the same principles, therefore, it generates dropsy and the other phenomena of a retarded circulation.

The effects of hypertrophy of the left ventricle on the brain are so pre-eminently important that it is necessary to advert particularly to this subject, for the purpose of bringing it prominently into view. Since the researches of the present day have demonstrated that even a slight thickening of the walls of the heart constitutes a morbid state, and have unfolded to view the connection subsisting between that state and a train of symptoms formerly either wholly overlooked or attributed to other causes, instances of apoplexy supervening upon hypertrophy have been so frequently noticed, that the relation of the two as cause and effect is one of the best established doctrines of modern pathology. Eight or nine cases of suddenly fatal apoplexy, and numerous cases of palsy, from hypertrophy, have, within a few years, fallen under our own observation. In the majority of them the patient exhibited what is commonly called the "apoplectic constitution;" that is, a robust conformation, a plethoric habit, and a florid complexion: in others, these characters were absent; but the total number of the cases of apoplexy from hypertrophy is much greater than we have witnessed, during the same period, of apoplexy from causes independent of hypertrophy; whence we are led to believe, with MM. Richerand and Bertin, that hypertrophy forms a stronger predisposition to apoplexy than the apoplectic constitution itself; and that, in most instances, those persons who present the apoplectic constitution in conjunction with symptoms of increased determination to the head, are, at the same time, affected with hypertrophy.

Nor is it to apoplexy alone, but to cerebral inflammations and irritations of every description, and even to inflammatory action in general, that hypertrophy of the left ventricle gives a tendency. The history of individuals affected with it frequently presents a striking narrative of violent headachs, brain fevers, various inflammatory complaints, and states of great nervous irritability and excitation. As the ophthalmic artery is derived from the carotid within the cranium, the eye participates with the brain in the effects of hypertrophy, and is vascular, brilliant, and very prone to ophthalmia. The wasting away of the eye which Professor Testa has remarked as one of the effects of disease of the heart, is, with good reason, supposed by M. Bertin to be connected with ossification of the ophthalmic arteries, a frequent concomitant of hypertrophy of the left ventricle.

The shock of an hypertrophous left ventricle may to a certain extent be intercepted, and its effects on the brain counteracted, by contraction of the aortic orifice. A patient was under the care of Mr. Babington, at St. George's Hospital, Sept. 16, 1829, for a surgical complaint, in whom the walls of the left ventricle were an inch thick, without any change of the cavity; and the aortic and mitral orifices were respectively encircled by a ring of bone as thick as a writing-quill. The two valves, though overspread with calcareous scales, were capable of discharging their functions. Notwithstanding this extraordinary state of disease, the patient had attained the age of eighty without manifesting symptoms of diseased heart sufficient to arrest his own attention or that of his medical attendants. His advanced age, indeed, proves that they could not have existed in any considerable degree. In this case, therefore, the valvular contraction appears to have been exactly sufficient to countervail the hypertrophy, and maintain the circulation in a state of equilibrium. The generality of authors, however, have greatly over-rated the power of contraction of the aortic orifice to counteract the effects of hypertrophy on the brain. They have supposed that a moderate and even a slight degree of contraction is sufficient for the purpose. There can be no greater error; and it is one into which they could not have fallen, had they been aware that an inconsiderable degree of contraction has very little effect in diminishing the strength, tension, and regularity of the pulse, as is shown in the article on valvular disease.

To have demonstrated the influence of hypertrophy of the left ventricle on the brain, is equivalent to having shown that of the right ventricle on the lungs. For, in the same way that the brain receives *directly* the shock of the blood, which the left ventricle shoots into the aorta, so the lungs receive *immediately* the impulse communicated to the column of blood, which the right ventricle propels into the pulmonary artery. Consequently, when the walls of this ventricle are augmented in thickness and energy, they impart a corresponding activity to the pulmonary circulation, and sometimes overcome the tonic power of the vessels. Hence ensues hemorrhage, or what was called by Laennec pulmonary apoplexy, from its taking place by the same mechanism as apoplexy properly so called, in cases of hypertrophy of the left ventricle. The hæmoptysis resulting from this cause consists of fluid, red blood, and is generally copious, sudden, and productive of febrile excitement of the circulation. It is, in short, an active, arterial hemorrhage, and essentially different from that passive species, hereafter to be described, which results from retardation of the blood in the venous capillaries of the lungs. (See Pulmonary Apoplexy and Hæmoptysis.)

Diagnosis of Hypertrophy.—The signs of hypertrophy are of two classes: 1. *general;* 2. *physical.* According to our experience, neither of these classes, taken separately, is sufficient to indicate any disease of the heart with perfect certainty; taken conjointly, they render the diagnosis so easy that a material error can scarcely be committed.

1. General Signs.—In describing these we shall follow the course of the circulation; commencing, after having noticed the action of the heart, with the circulation through the lungs, proceeding to that through the aortic system, and concluding with that through the veins.

The description of symptoms which we are about to offer, refers, it must be distinctly understood, to simple hypertrophy, unless when it is otherwise stated: the symptoms of *hypertrophy with dilatation,* which will be noticed in passing, are only an aggravated degree of the same—as the reader will sufficiently understand, if duly acquainted with the foregoing principles relative to the formation and effects of these diseases. When the dilatation predominates over the hypertrophy, the symptoms of course approximate more nearly to those of dilatation. (Vid. Heart, dilatation of the). The symptoms of *hypertrophy with contraction* will also be noticed incidentally with those of simple hypertrophy.

Palpitation.—By this is to be understood a morbidly increased action of the heart, both as to strength and frequency. As the hypertrophous heart acts with an energy which, even in its tranquil state, verges on palpitation, and which, under the slightest excitement, actually amounts to it, the patient experiences this symptom more unintermittingly than in any other disease of the organ. It is induced by stimulants of any description: as muscular efforts, particularly that of ascending; mental emotion; flatulence; acidity or bile; spirituous or highly seasoned ingesta, and sometimes by a full meal of any kind. The violence of the attack generally subsides promptly after the operation of the exciting cause has been suspended, and little remains but a slight sense of pulsation in the præcordial region. In the advanced stage, however, of hypertrophy, and still more of this conjoined with dilatation, when the circulation has become embarrassed, the paroxysms are sometimes very severe and prolonged, though they never attain that fearful extreme of violence and obstinacy which is witnessed in cases complicated with valvular or aortic obstruction, or adhesion of the pericardium.

Dyspnœa.—While the enlargement of the heart is moderate, the patient, during a tranquil state of the circulation, feels little or no difficulty of respiration; but he is incapable of making the same corporeal efforts as other persons without losing breath: to use a common phrase, he is "short-winded." After a respite of a few minutes, however, he recovers, and is, therefore, seldom deterred by this symptom from prosecuting his accustomed avocations. We have frequently observed that individuals who pant on first setting out on a walk, are capable of sustaining great exertions without inconvenience when they get warm and the blood is freely determined to the surface. When the disease has proceeded so far as to occasion dropsy, more or less dyspnœa becomes habitual, and it sometimes occurs, conjoined with palpitation, in paroxysms of excessive severity. From this period, indeed, the symptoms are a compound of those of hypertrophy and those of an obstructed circulation, the latter of which are more particularly considered in the article Dilatation. Hypertrophy with contraction, as already stated, is sometimes accompanied with symptoms of an obstructed circulation.

Cough.—There is generally little or no cough in the early stages, but it always supervenes when dropsy appears, in connection with which more or less sanguineous and serous congestion almost invariably takes place in the lungs, and gives rise to the symptom in question. When the hypertrophy is confined to the left ventricle, the cough is milder and later in its appearance than when the right ventricle is affected. We have seen a dry, hacking and wheezing cough amongst the earliest symptoms in young and plethoric females, whom it attacks in paroxysms after any over-exertion, as ascending a stair. It is often also very troublesome on first rising in the morning.

Hæmoptysis.—This may occur at any period of the disease, and the hemorrhage, being *active*—the result of a too impetuous discharge of blood into the capillary system—is generally sudden and copious, consists of fluid arterial blood, and is attended with febrile excitement.

Pulse.—The pulse in hypertrophy of the left ventricle undergoes, from valvular and other lesions, a variety of modifications which disguise its real nature. It must, therefore, be studied in cases totally exempt from complication. In such it is almost invariably regular, and bears strict relations in strength and size to the thickness and capacity of the left ventricle. Thus, in simple hypertrophy it is stronger, fuller, and more tense than natural: it swells gradually and powerfully, expands largely, dwells long under the finger, and is sometimes accompanied with a thrill or vibration. These characters are still more marked in hypertrophy with dilatation, so long as the hypertrophy is predominant; but when the dilatation has proceeded so far as to diminish the contractile power of the muscular fibres, the pulse, though still full and sustained, is soft and compressible. In hypertrophy with contraction of the cavity, it is strong, hard, and tense, but small and cord-like, expanding little under the finger. The action of the carotids corresponds with that of the radials, and they may generally be seen to pulsate from the sternum to the angle of the jaw. In the temporals also a sense of throbbing is usually experienced.

Affections of the Head.—The patient complains of a "rushing of blood to the head" on making any corporeal effort or stooping; of intense throbbing and lancinating headachs, aggravated by the recumbent position, and especially by the act either of suddenly lying down or rising up; he complains also of vertigo, tinnitis aurium, scintillations and other visual illusions; and sometimes of a lethargic somnolency, which so completely subdues the faculties both of the mind and the body, as utterly to incapacitate him for every species of exertion. These symptoms, if not relieved, terminate in palsy or apoplexy. From this catastrophe the patient is often preserved by the opportune occurrence of epistaxis, to which, happily, he is peculiarly liable. From the circulation in hypertrophy being active in the eye, this organ is bright and sparkling, and sometimes vascular or blood-shot.

Complexion.—The effect of hypertrophy is to heighten the colour so long as the capillary circulation continues unembarrassed, but afterwards to diminish and change it. Every individual, however, does not acquire a florid colour. Whether he acquire it or not, depends, in truth, upon the original complexion, the series of changes being different in those who are naturally florid, and those who are pale—a fact not generally known. In the former, the colour becomes remarkably vivid, and being generally accompanied with plethoric turgescence, it gives the aspect of health and good condition. But when the capillary circulation begins to labour, the red changes into a purplish patch on the cheeks, the nose and lips become more or less purple, violet, or livid, and the intermediate skin becomes sallow and cachectic. In great hypertrophy with dilatation the purple and violet colours are sometimes of the deepest dye. In those who are naturally devoid of colour, hypertrophy either does not excite it at all, or merely increases in a slight degree the general vascularity of the face. This vanishes entirely when the capillaries become obstructed, and is superseded by universal cadaverous paleness, extending sometimes even to the lips. They, however, are generally somewhat livid.

Serous Infiltration. — This, for reasons already assigned, seldom appears before the hypertrophy is very considerable or becomes conjoined with dilatation. It frequently shows itself first in the face; a circumstance attributable to the great number and size of the cerebral arteries, and to the force with which the blood is injected into them in consequence of their proximity to the heart. With the dropsy supervene, to a greater or less degree, all the other symptoms of an obstructed circulation.

Signs of Hypertrophy of the right Ventricle.—Hypertrophy of the right ventricle produces, according to Corvisart, a greater difficulty of respiration and a deeper colour of the face than is produced by the same affection in the left ventricle. Another sign is, the more frequent expectoration of pure arterial blood.

Turgescence of the external jugular veins accompanied by pulsation synchronous with that of the arteries, was pointed out by Lancisi as a sign of "aneurism," i. e. *hypertrophy with dilatation*, of the right ventricle; and we have rarely known it absent in this affection. Of such cases, therefore, we regard it as one of the best general signs. Venous pulsation is not, in our opinion, attributable to regurgitation through the tricuspid valve, as Bertin supposes; in substantiation of which opinion we may say that regurgitation would be attended with a bellows or other such sound: this sound, however, is not found to be a concomitant of jugular pulsation. Is the rationale of the phenomenon as follows? namely, as the ventricle, when hypertrophous, contracts with augmented power, the recoil of the tricuspid valve is preternaturally impetuous: hence, the column of blood in the act of descending into the ventricle is repelled with such an increase of force, that its impulse is propagated as far back as the jugular veins. This effect would be more considerable when the orifice and valve are enlarged, as is usually the case in hypertrophy with dilatation, because the quantity of fluid repelled would be greater. The effect would also be favoured by congestion of the great veins, (a state which generally accompanies hypertrophy with dilatation of the right ventricle,) because, when congested, they are more tense unyielding tubes, and transmit an impulse more readily.

The jugular pulsation is double: a weaker pulsation precedes that occasioned by the ventricular systole. The weaker is occasioned by the auricular systole, and the mechanism of its formation we conceive to be this: at the time that the auricle contracts, the ventricle is in a state of moderate or natural fulness; it therefore offers a certain degree of resistance to the ingress of more blood from the auricle; consequently, so much of the blood compressed by the auricular systole as cannot get forward into the ventricle, is forced back into the veins and causes their pulsation.

A difficulty has sometimes been experienced in distinguishing jugular pulsation from that of the carotid arteries; an error which may easily be avoided by observing that the jugular pulsation is confined to the lower part of the neck, and is far on the humeral side of the carotid. The pulsations of the artery, on the contrary, extend as high as the angle of the jaw, and in the direction of the anterior margin of the sterno-cleido mastoideus muscle.

The jugular turgescence, again, disappears in some degree during inspiration, and reappears on expiration; which movements, therefore, must not be confounded with the pulsations answering to the systole of the ventricle.

General Signs of Hypertrophy of the Auricles. — There are none that are distinguishable from those of disease or obstruction in the corresponding ventricle or orifice, to which the hypertrophy of the auricles owes its origin. The detection of hypertrophy of the auricle is of little importance, the cause that produced it being the source of danger.

II. Physical Signs. — *Impulse.* — In *simple hypertrophy*, the impulse communicated by the stethoscope while the patient is in a calm state, is usually so strong as distinctly to raise the head of the observer, and sometimes even sufficient to produce a shock disagreeable to the ear. The greater the hypertrophy, the longer this heaving takes for its performance. When the malady exists in a great degree, we evidently perceive that the heaving takes place with a gradual progression; it seems as though the heart swelled and applied itself to the parietes of the chest, at first by a single point, then by its whole surface, and finally sank back in a sudden manner. This sinking back, which we have been in the habit of designating by the term *back-stroke*, [" *diastotic i-*

pulse,"] is occasioned by the diastole of the ventricles, during which action the heart sinks back from the walls of the chest with a force greater in proportion to its thickness and capacity. Accordingly, the *back-stroke* is strongest in hypertrophy with dilatation, but it may also be very considerable in simple hypertrophy. In the healthy heart it is not perceptible, neither is it in dilatation without hypertrophy.

A strong, slowly heaving impulse, then, is the principal sign of simple hypertrophy; and the affection may be known to be greater when the impulse is followed by a back-stroke. Both these signs exist in hypertrophy with contraction, but in a less degree, and the back-stroke may be absent if the disease is not great.

In simple hypertrophy and that with contraction, the impulse is seldom perceptible much beyond the præcordial region, except during attacks of palpitation.

In *hypertrophy with dilatation* the signs are a compound of those of hypertrophy and those of dilatation. The contraction of the ventricles can easily be felt by the hand applied to the præcordial region, and we find, especially during palpitation, smart, violent shocks, which strongly repel the hand. If we attentively examine the patient, even when most calm, we see that his head, his limbs, and even the bed-clothes, are strongly shaken at each contraction of the heart. The pulsations of the carotids, the radials, and the other superficial arteries are often visible. The impulse of the heart can sometimes be distinctly felt under the clavicles and on the left side of the thorax; sometimes even in the back, especially in meagre subjects and children.

In hypertrophy with a predominance of dilatation, the pulse is ordinarily not considerable; but it becomes very marked during palpitation, especially if accompanied with fever, and it has a very different character from that occasioned by simple hypertrophy. The beats are strong, hard, and produce a shock analogous to the blow of a hammer; but the blow seems to strike a small space; it expends itself as it were on the thoracic parietes, and does not communicate to the head of the auscultator a heaving proportioned to its force: it differs, in short, from the impulse occasioned by great hypertrophy, in the circumstance that, in the latter, the ventricles in a distended state seem to heave with their whole length against the thoracic parietes, which yield to the effort; while, in the former case, the point only of the heart seems to strike the parietes with a sharp, smart, accurately circumscribed blow, only capable of producing a sort of concussion rather than a real heaving. The same species of impulse takes place in purely nervous palpitations, in reference to which we have called it *jerking*.

When the impulse is increased on one side only of the præcordial region, that is under the inferior part of the sternum for the right side, and between the cartilages of the fifth and seventh left ribs for the left, we infer that the corresponding ventricle only is affected; and when it is increased on both sides, we conclude that both are affected, which is more commonly the case.

In hypertrophy, and hypertrophy with dilatation, independent of valvular disease, the beats of the heart even during palpitation are rarely irregular, unless when they become enfeebled by excessive dyspnœa or by failure of the vital powers on the approach of dissolution.

The impulse of the heart is diminished by loss of blood, diarrhœa, any exhausting disease, rigid and long-continued abstinence, and, in general, by all the causes capable of producing debility. Consequently, a moderate hypertrophy might, without due care, be overlooked in a patient under any of these circumstances.

The impulse of the heart, moreover, may, even in cases of marked hypertrophy, cease entirely when there supervenes intense dyspnœa, connected with some affection of the lungs, especially peripneumony, pleurisy, œdema of the lungs, asthma, and the pulmonary congestions which form during the last moments of life. The sounds likewise diminish, or even entirely cease: no inferences, therefore, should be drawn from an exploration made under such circumstances.

Sounds. — Hypertrophy has the effect of deadening the sounds of the heart. In simple hypertrophy, the first sound, i. e. that produced by the ventricular contraction, is duller and more prolonged than natural in proportion as the hypertrophy is more considerable, and it generally terminates in the second sound without any interval. When the hypertrophy exists in an extreme degree, the first sound becomes nearly and sometimes wholly extinct. The second sound, i. e. that produced by the ventricular diastole, is very brief and dull, and in extreme cases scarcely perceptible. The interval of repose is shorter than natural, in consequence of the first sound being longer. Both sounds are proportionably weaker when the ventricle is contracted as well as hypertrophous. In most cases of this description the sounds can scarcely be heard under the left clavicle and at the upper part of the sternum. Sometimes they cannot be heard farther than the impulse can be felt; that is to say, scarcely beyond the limits of the præcordial region.

Each sound of the heart, though essentially one, consists of the sounds of the two sides united. This is proved by a bellows murmur in the left præcordial region being audible in the right, and vice versâ. It does not follow, therefore, that because one ventricle is hypertrophous, the sound of the heart in general should be very limited in its range; for that of the other will be heard over an extent proportioned to its intensity, though not quite so far as when strengthened by its fellow. On the other hand, a morbidly increased sound of one ventricle, as by dilatation or a bellows-murmur, will be heard *alone* at points beyond the range of the natural sound of the other or healthy ventricle. Accordingly, it is only in hypertrophy of both ventricles that we must expect to find the sounds confined within very narrow limits.

We have not been able to verify the remark of Laennec, that "in hypertrophy, often when a strong heaving, without any first sound, is felt in the præcordial region, and the second sound can scarcely be distinguished, the latter is heard alone under the clavicles, and even on the back; and in less severe cases of this kind it is always heard more distinctly in these places than in the præcordial region, especially in meagre and narrow-chested persons." We cannot understand on what principle it could be so, even supposing the auricular contraction were, as he imagines, the cause of the second sound; for as both the right auricle and ventricle are in immediate proximity and partly in contact with the sternum, it is inconceivable how the sound of either should be less distinct not an inch from its source than at a remote point. We have, however, found Laennec's remark true when the sound was drowned in the præcordial region by a bellows-murmur or pulmonary râle; the explanation of which is, that the second sound, being of a more acute nature than the murmurs, is more readily transmitted to a distance.

On the same principle also, is to be explained another doctrine of Laennec, the accuracy of which we have frequently verified: namely, that "in healthy subjects, but in whom the heart has rather thin walls, the sound is sometimes stronger under the clavicles than the first, although the same difference is not observable in the præcordial region." The reason of this is, that the second sound, being more acute, is more easily propagated.

In hypertrophy with dilatation the sounds are increased. The first is, as it were, a compound of the sound of dilatation and that of hypertrophy: namely, from dilatation it derives a loud, abrupt, or flapping commencement, and from hypertrophy a prolonged termination, like a respiratory murmur. The second sound, though not in general changed in its character, is louder than natural. These sounds may frequently be heard over the whole chest, both posteriorly and anteriorly, especially in children and meagre subjects.

In hypertrophy with dilatation the sound of the ventricular contraction is sometimes accompanied with a bellows-murmur. This we have found to be almost always the case when the heart is extremely large and contracting with vehemence. The sounds of the heart, in every form of hypertrophy, may be diminished by the same causes that diminish the impulse.

Resonance (See much valuable information on this subject in the "Procédé Opératoire" of M. Piorry, Paris, 1830, p. 112, et seq.) of the præcordial region on percussion is defective in simple hypertrophy, provided the heart be considerably enlarged; but, as hypertrophy and dilatation is the disease in which the organ attains the greatest volume, it is that in which resonance is most frequently and most extensively defective. In all cases of considerable enlargement the dulness as well as the impulse are lower down than natural, except in adhesion of the pericardium, by which affection the heart is more or less braced up.

Progress and Termination of Hypertrophy.—Hypertrophy, while moderate, and not complicated with any mechanical impediment to the circulation, is productive of very little inconvenience. This is especially true with respect to children. In them the heart is naturally larger in proportion than in adults; and in many this amounts to a very considerable degree of hypertrophy with dilatation, accompanied with greatly increased impulse and sound; yet the general symptoms manifested by such are often scarcely appreciable, and the increased action itself subsides towards the period of puberty by the establishment of a more correct proportion and equilibrium between the heart and the system.

At the adult age also, and during the whole period of manhood, an individual of an otherwise sound and vigorous constitution may be affected with hypertrophy to a moderate extent, without experiencing any sensible deterioration of the general health (with the exception of being more liable than others to cerebral and phlogistic affections), or any diminution of muscular force and activity; and if his habits with respect to diet and exercise be moderate, he may pass a long series of years, and even attain the extreme period of senility, without being conscious that he is the subject of organic disease. The only general signs denoting the existence of the malady will be, perhaps, a little shortness of breath on exertion, and occasional feelings of slight palpitation. Amongst the labouring classes these symptoms, even in a considerable degree, are so little regarded that their presence is often disavowed by the patient, though palpably manifest to the physician. If, however, an individual affected with hypertrophy abandon himself to intemperate living, or engage in occupations requiring great corporeal exertion, he rarely fails to bring on either apoplexy, palsy, hemoptysis, or an irremediably aggravated state of the disease, which embitters and curtails his existence.

The celerity with which these accidents are induced depends on circumstances. In general, the progress of hypertrophy is very slow and gradual, but in some cases it is rapid: in several instances we have known it terminate fatally within a year from its commencement. The circumstances occasioning these variations are connected with—1, the form of the disease; 2, its complications; 3, the nature and intensity of the external exciting causes; and, 4, the constitution of the patient. It is of the utmost importance that the practitioner be able to form some estimate of the influence of these circumstances; for it is by this means only that he can foresee the course of the disease, and direct his treatment with judgment and decision. It may be useful, therefore, to enlarge a little on this subject.

1. The progress and termination of hypertrophy are influenced by the form of the disease. *Simple hypertrophy* is more apt than any other form to induce apoplexy while the patient is apparently in perfect health. This is to be accounted for by its tendency to create plethora, while at the same time it does not incapacitate the patient for active corporeal exercise and the pleasures of the table. When premature death does not occur from apoplexy or hemoptysis, simple uncomplicated hypertrophy runs a more chronic course than any other form of the disease.

Hypertrophy with dilatation, especially if great, is a far more harassing, dangerous, and, if we may be allowed the term, *acute* affection than the preceding. All its symptoms are more violent, and its course is more rapid. It is somewhat less apt to occasion unexpected attacks of apoplexy; probably because the greater dyspnœa which it occasions deters the patient from violent exercise and high living. When once the palpitation and dyspnœa have attained such an extent as *imperatively* to demand periodical bleedings at brief intervals, the malady hurries with an uninterrupted course to its fatal termination.

2. The progress and termination of hypertrophy are influenced by its complications. When hypertrophy is connected with contraction of an orifice or any other obstacle to the course of the blood, the symptoms are greatly aggravated. For, first, in consequence of that obstacle, the hypertrophy proceeds to a greater extent; and, secondly, the violent struggles of the heart to surmount the obstacle subvert the general balance of the circulation. To speak more explicitly, suppose the obstacle to be situated in the aortic orifice. While the left ventricle is palpitating to disgorge itself through the contracted aperture, the right, acting in concert with it, deluges the lungs with an inordinate quantity of blood; whence ensues a paroxysm of dyspnœa: next, in consequence of the pressure of blood through the lungs, the supply to the left ventricle is increased. This ventricle, therefore, instead of relieving its engorgement by palpitation, only aggravates it, and the fit does not subside until either the heart becomes gradually exhausted by its own efforts, or (what is more common) until the internal congestion is relieved by determination to the surface or a copious discharge of watery mucus from the lungs. The most *violent*, though perhaps not the most *distressing*, paroxysms of palpitation and dyspnœa that we have witnessed have occurred in the particular complication described. In others there may exist a greater feeling of suffocation (the source of the greatest distress), as will hereafter be explained in the articles HEART, DISEASES OF THE VALVES OF THE, and POLYPI.

Adhesion of the pericardium, which rarely fails to produce hypertrophy with dilatation, is an extremely formidable complication of this malady. It greatly aggravates all the symptoms, and accelerates the fatal event, which not unfrequently takes place within the period of a year; and we have known it occur in nine months.

Febrile or inflammatory complaints supervening on an advanced degree of hypertrophy exasperate the malady in a surprising manner, so as not unfrequently to carry off the patient in the course of a few days. The effect seems to be produced by the febrile excitement keeping up, as it were, a perpetual fit of palpitation and embarrassment of the circulation, which the constitution cannot support beyond a brief period. Peripneumony has pre-eminently this effect; apparently because it not only excites the heart, but obstructs the circulation through the lungs.

3. The progress and termination of hypertrophy are influenced by the nature and intensity of the external exciting causes.

The principal of these are, over-exertion, excesses at table, and mental perturbation, the latter of which, though not strictly external, may be ranged under this head. The effect of these requires no explanation, but it may be said that the dangerous influence of over-eating is greatest in simple hypertrophy, because it generates plethora and increases the tendency to apoplexy; while ove exercise and intemperance are more prejudicial in hypertrophy with dilatation, because they increase the dilatation, which is the more dangerous part of the disease.

4. The progress and termination of hypertrophy are influenced in a remarkable degree by the constitution of the patient. The robust resist its encroachments much longer than those who are delicate and effeminate: and if the former, either from bad air or want of exercise, from disease, or from age, become unhealthy, emaciated, and feeble, they are rendered much more susceptible of the effects of the disease. This (if we may indulge in a mere speculation) is possibly in consequence of emaciation taking place to a greater extent in the muscular and adipose tissues than in the internal viscera, whence, the latter becoming predominant in size, the equilibrium between the heart and the system is subverted. This is exactly the converse of what occurs at the period of puberty in those who had laboured under enlargement of the heart when children, for in them the equilibrium is restored by the system enlarging with the growth in proportion to the size of the heart.

Prognosis.—The general prognosis is favourable in the early and unfavourable in the advanced stages of the disease. The particular prognosis must be founded on an estimate of the various circumstances of the case formed according to the above rules.

Treatment of Hypertrophy.—As it is easier to diminish the nutrition of the heart than to increase it, or to remove a valvular or other mechanical obstruction, it is very conceivable that hypertrophy is more susceptible of cure than any other organic affection of the heart.

In the treatment the first care should be to remove any known exciting cause of the malady. It is equally obvious that as this malady consists in an increased power and action of the heart, bloodletting and other reducing and tranquillizing means are the appropriate remedies. Laennec strongly recommends that they be employed with courage and perseverance on the plan of Albertini and Valsalva. We cannot say that our own observation leads us to coincide entirely in this opinion. We shall first, therefore, give a sketch of the treatment alluded to, the sanction accorded to which by names of the highest authority renders it at least deserving of the most attentive consideration; and shall afterwards point out in what respects it appears to us to be objectionable.

This treatment, according to M. Laennec, ought to be prosecuted in an energetic manner, especially in the commencements; and in aiming to enfeeble the patient, we ought much more to fear resting short of the mark than exceeding it. We should commence by abstracting blood as copiously as the patient can support without falling into a state of sinking; and we should repeat the operation every two, four, or eight days, until the palpitations have ceased, and the heart no longer gives, under the stethoscope, more than a moderate impulse. We should, at the same time, reduce to at least one-half the quantity of aliments which the patient ordinarily takes, and diminish even this quantity if he preserve more muscular strength than suffices to take, step by step, a walk of a few minutes in the garden. In a stout adult, Laennec usually reduces the quantity of aliments to fourteen ounces a day, amongst which he thinks there should be only two ounces of white animal food. If the patient wishes to take broth or milk, he counts four ounces of these liquids for one of animal food. Wine ought to be interdicted. When the patient has been about two months without experiencing palpitation, and without strong impulse of the heart, we may dispense with the bleedings, and somewhat diminish the severity of the regimen, if habit has not yet been able in any degree to reconcile him to it. But it is necessary to revert to the same means, and with equal rigour, if in the sequel the impulse of the heart increase again. We ought not to have confidence in the cure until the expiration of a year of complete absence of all the symptoms, and especially of all the physical signs of hypertrophy. We must be afraid of allowing ourselves to be deceived by the perfect calm which bloodletting and abstinence sometimes very promptly produce, especially if we have commenced the treatment at a period when the hypertrophy was already accompanied with extreme dyspnœa, with anasarca, and with other symptoms which gave reason to fear an approaching death.

If we begin the treatment of hypertrophy of the heart at a period when it has already produced severe effects, particularly anasarca, ascites, œdema of the lungs, and a very marked state of cachexy, we ought not on that account to shrink from bleeding and abstinence. To obtain success, it is necessary, according to the same author, that the physician and the patient arm themselves with almost equal patience and firmness; for it is not more difficult for the latter to resign himself to perpetual fast and frequent bloodlettings, than for the former to struggle daily against the opposition of relations and friends, and the discouragement which cannot fail to seize upon the patient in a treatment which ought to continue at least several months, and sometimes to be prolonged during several consecutive years.

Such is the manner in which M. Laennec employs the treatment of Albertini and Valsalva; and he states that he could cite a dozen instances of cures of hypertrophy, either simple or with dilatation, which have not been falsified for several years. One important case which he details, seems to prove that the treatment causes atrophy of the heart; for the organ was remarkably less than the fist of the subject, and was shrivelled or wrinkled in a longitudinal direction.

Our objections to the treatment described are founded on the circumstance that, though we have invariably found the greatest benefit to be derived from sparing abstractions of blood at intervals of two or three weeks or more, we have constantly noticed that when, from the severity of the dyspnœa and palpitation in the advanced stages of the complaint, the practitioner was induced, or thought himself compelled, to resort to frequent bleedings at short intervals, the patient, though perhaps momentarily relieved, progressively declined from that moment, the paroxysms recurring more frequently and with greater violence, until they eventually terminated in his destruction. Now, on comparing a patient under these circumstances with one under the influence of mere reaction from loss of blood, the analogy appears to us to be very intimate. In both, the violence of the heart's action, so far from being repressed by a reiteration of the bloodletting, is only increased; in both the blood is, and necessarily must be, attenuated and deteriorated in consequence of the fibrinous portion and red globules being replaced to a greater extent than natural by serum, which is more expeditiously regenerated.

These, then, are apparently the causes of the patient's decline. The prejudicial effects of the re-action are sufficiently obvious; and the state of the blood not only contributes in all probability to the re-action, (Vid. Treatise on Diseases of the Heart, by the writer, p. 75,) but, by its deteriorated quality, is unsuitable for the due nutrition and conservation of the system.*

It would appear, therefore, that the indications in the treatment of hypertrophy are, to diminish the quantity without materially deteriorating the quality of the blood, and to do this in such a manner as, without producing re-action, permanently to enfeeble the action of the heart and the energy of the circulation. The safest and most effectual means of fulfilling these indications have appeared to us to be the following:

Four, six, or eight ounces of blood should be taken every two, three, four, or six weeks, according to the strength of the patient, and sufficient to keep down palpitation, dyspnœa, and strong impulse of the heart. If the head be much affected, the blood should be drawn by cupping from the nape of the neck. The diet should consist of white animal food and liquids in small quantity, unless, from the advanced state of the disease, the blood be so impoverished as to be insufficient for the maintenance of the system, when a more nutritious though still spare diet may be allowed. Every thing stimulating, as spirituous and fermented liquors, and highly seasoned dishes, should be avoided. Any exercise taken should be so gentle as never to hurry, and, if possible, never even in the slightest degree to accelerate the circulation. When the action of the heart appears to increase, and yet general bleeding is not expedient, three or four copious and watery alvine evacuations should be procured daily by saline aperients, of which none answers better than one or two drachms of sulphate of magnesia in infusion of roses twice or thrice a-day. This may be continued for a week or ten days according to the effect; and either the same or some analogous aperients should be employed habitually in sufficient doses to keep the body gently open, and to procure, if possible, liquid evacuations. When salines are used habitually, their debilitating effects on the intestinal canal may be in a great measure counteracted by adding to the infusion of roses an equal quantity of compound infusion of orange-peel, and six or eight minims of diluted sulphuric acid.

In addition to purgatives we have seen the most decided advantage result from diuretics; and not only when there was dropsy, but equally when there was none. Their mode of operation appears to be ultimately the same as that of purgatives; namely, they drain off the serous portion of the blood. We have found many patients, conscious of the benefit which they derived from this class of remedies, to be in the constant habit of taking cream of tartar, broom-tea, and other similar popular medicines. One patient affected with contraction of the mitral valve to the size of an ordinary pea, by these means warded off dropsy, beyond the slightest œdema of the feet, for ten years. When decided dropsy appears, it must be combated by the most efficient diuretics—the super-tartrate, tartrate, acetate, and nitrate of potass, squill, digitalis, spirit of nitric ether, decoction of broom, &c., with mercury if not contraindicated. As no class of remedies is more variable and uncertain than this, when one fails another should be resorted to; and it not unfrequently happens that a weaker is more successful than a stronger. Should diuretics wholly fail, hydragogue purgatives, as elaterium, tincture of jalap, infusion of senna with tartrate of potass, &c. are often invaluable substitutes.

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* It does not follow that though the treatment of Albertini and Valsalva be unsuitable for hypertrophy, it is equally so for aneurism of the aorta; as in the latter the object is to produce a sudden and extreme, though temporary reduction of the force of the circulation, in order to promote the formation of fibrinous coagula in the sac: an expedient which is sometimes perfectly successful in effecting a cure of aneurism, but which will not have the same effect on hypertrophy.

The state of the stomach and of the biliary secretion should never be overlooked in hypertrophy, as their derangements are amongst the most efficient exciting causes of palpitation. The remedies suitable for dyspepsia and bile are therefore to be resorted to. We deem it unnecessary here to enlarge on them, and on the treatment of dropsy, cough, dyspnœa, &c., as these subjects will be found fully discussed in the article Heart, (Diseases of the Valves of the).

It frequently happens that, notwithstanding the most judicious use of the remedies mentioned, the irritability of the nervous system frustrates their tendency to reduce and tranquillize the action of the heart. In this case sedatives are eminently useful, and the best effects often result from tincture of digitalis, to the extent of *m*.xx. or xxx. twice or thrice a-day; from two or three drops of hydrocyanic acid, administered as often; from three or four or more of extr. of hyoscyamus or conium once or twice a-day; and from half a grain of acetate of morphia twice a-day.

The above, and indeed every other mode of treatment is unavailing if not *steadily* pursued, and it must be pursued for one, two, three, or more years. Thus employed, we have found it effect cures in a considerable number of instances, some of which were advanced even to the second degree. In the first degree, especially before the period of puberty, this fortunate event is often obtained although bleeding be resorted to only at long intervals, as of from six weeks to three months. [See Pennock's edit. of Hope, *on Diseases of the Heart*, p. 230.]

J. Hope.

[HEART, (INFLAMMATION OF THE)—See Carditis and Pericarditis.]

HEART, (MALFORMATIONS OF THE)—Under this head we comprehend all those deviations from the natural mechanism or form of the heart which are developed in its original conformation, or in the progress of its early growth. They arise, for the most part, from an arrest or interruption in those successive changes which the heart undergoes from its first formation until it is adapted to support the double circulation of post-natal life; but as in the case of other monstrosities, they sometimes consist of an irregular, and sometimes of a superfluous, development of parts.

1. Defective Malformations.—As there is a period in fœtal life in which the heart does not exist, so there have been instances in which the constructive process has been at this period interrupted with respect to this organ; so that, while other parts of the body were more or less perfectly developed, the heart was entirely deficient; its place being sometimes occupied by a mere sac or net-work of vessels, as in the zoophytes, and in other cases the communication between the arterial and venous system being direct. In nearly all the cases of *acardia* on record, the brain and spinal marrow were also wanting; but Andral (Pathological Anatomy, translated by Drs. Townsend and West, vol. ii.) quotes an instance from the second volume of the *Répertoire d'Anatomie*, in which the nervous centres were nearly entire, but there was neither heart, nor lungs, nor large vessels. As these are cases more of physiological than of practical interest, we need not dwell longer upon them.

It has not been distinctly ascertained by observation that the heart of the embryo is ever quite of the simple structure of the heart of fishes: in the early stages of its existence, however, it differs only in having the rudiments of a septum at the apex of the ventricle, and probably at a more remote period it is quite simple, consisting of a single auricle and ventricle; and this condition remaining stationary until birth, constitutes a variety of malformations of the lowest order. Of this description we find the record of eight instances.* In these cases the aorta gives off one or more pulmonary arteries, and the pulmonary veins terminate either in the auricle or in the vena cava. Some of these infants lived for several days without any *apparent* irregularity or defect in the performance of their functions, except some dyspnœa and blue discoloration of the skin, which varied considerably in different instances and at different times. In Dr. Farre's case the skin was very pale, and with but slight lividity, while the action of the heart and diaphragm was excessive; and these symptoms are explained by the fact that the orifice of the aorta was much contracted, so that, while the system was ill-supplied with blood, the heart and lungs were kept constantly engaged. Of the two cases related in the Philosophical Transactions, one lived ten days with no other uncommon sign than a purple skin; in the other this only occurred shortly after birth and again just before death, which happened on the eighth day.

The next gradation of malformation is that in which there are two auricles with one ventricle. Of this we have found only two examples recorded, the subject of one of which, quoted by Laennec from Kreysig, (vol. iii. p. 100,) attained the age of twenty-two years. This fact proves that, great as the anomaly in this case was, the body can

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*1. Phil. Trans. 1798, p. 2; 2. ibid. 1805, p. 2: 3. *Dr. Farre*, Patholog. Researches; 4. Ephem. Nat. Cur., Dec. 1,Obs. 40; 5. ibid. Dec. 2, Obs. 44; 5. *Fleischmann*, Leichenoffnungen, 1815; *J. F. Meckel*, de Monstrosa Duplicitate, 1815; 8. *Burns*, on Diseases of the Heart, p. 27.

better adapt itself to this sort of reptile-like circulation than to those malformations which greatly obstruct the course of the blood.

Nearly allied in effect to the preceding, although their more perfect structure would entitle them to a step higher in the class, are the cases of imperfections or perforations of the septa between the ventricle and between the auricles.[*] Many of this kind have been described, in a considerable variety of combination. There is commonly a contraction of the orifice of the pulmonary artery, and in the fœtus born with this malformation the ductus arteriosus is either totally wanting, or imperforate. Some subjects of this malformation have survived for several years, (one reached twenty-seven,) but always in a state of great disorder, being affected with blueness of skin, faintings, &c. The foramen in the septum of the ventricle is always nearest to the base of the heart, and it is often so near the origin of the aorta or of the pulmonary artery, that the vessel communicates freely with both ventricles. These all appear to be instances of arrest of development, corresponding with the state of the fœtal heart in the early stages of its existence; and the disorder which they occasion in post-natal life is generally in proportion to the extent of the imperfection, but it is always greatly augmented wherever there is a contraction of the arterial orifices.

The last order of malformations from simple interrupted development or adaptation are those in which the heart retains, after birth, one or both of the peculiarities naturally destined only for the fœtal state, the open state of the foramen ovale and of the ductus arteriosus. As the occlusion of these channels of auxilary circulation is essential to the well-being of the perfect breathing animal, nature admirably contrives that the first respiratory act shall in normal cases effect this change, and the means by which it fulfils this end are worthy of attention. According to Meckel, there is little difference in thickness between the two ventricles of the heart at the time of birth, the left scarcely presenting any of that superiority which is so evident in after-life. In fact, it appears that before birth the right ventricle, through the ductus arteriosus, assists the left in the systemic circulation; and when the post-natal change takes place, there must be not only an additional outlet given to the blood from the right ventricle, but also an increase of power to the left ventricle, to maintain the aortic circulation; which now depends solely on it. A full and perfect respiratory act fulfils both these objects; by expanding the lungs it gives a free outlet to the blood from the right ventricle, and, by arterializing the blood which returns to the left ventricle, it stimulates it to such an increased energy of contraction as enables it, unaided, to supply blood through the system. This increased energy is soon followed by an increased thickness of the muscular walls of the ventricle, which gives a permanency to the greater power required in its important function. The ductus arteriosus, thus freed from the current of blood through it, contracts, as in the case of all obstructed or empty arteries, into an impervious cord. The progress of this contraction has been minutely described by Bernt as a test applicable to the investigation of cases of supposed infanticide. (Handbuch der Gerichtlitch. Arzneikunde.)

The obliteration of the foramen ovale is probably a much slower process, and one of less consequence, for its ordinary state at the time of birth is such that, unless there be considerable inequality of pressure between the auricles, it is sufficiently closed by its valves to prevent the passage of blood through it.

From these circumstances we are inclined to consider patescence after birth of the foramen ovale in most cases, and of the ductus arteriosus in every case of its occurrence, to be the result of loss of balance between the effective forces of the two sides of the heart at the time of birth. The ductus arteriosus stands in the same relation to both ventricles, that is, it communicates with the great artery proceeding from each: as long as these two arteries are filled with equal force, there will be no current in the duct; and such is the state under which, in natural cases, it contracts into an impervious tube. But if there be greater pressure on one end, whether from the pulmonary artery or from the aorta, a current must then pass from the stronger to the weaker side. Now the causes of such an inequality of pressure are various; and it will be worth while to point out a few of them, as we shall thereby gain a clearer understanding of the complicated pathology of several kinds of malformation. In several cases on record the open state of the ductus arteriosus has been found in conjunction with a manifestly contracted state of the orifice of the pulmonary artery, and in some with its total obliteration. Dr. William Hunter relates the case of a child born in the eighth month of gestation, which, after exhibiting a livid skin, dyspnœa, and violent palpitations, died of convulsions on the twenty-third day from its birth. On dissection, the pulmonary artery was found reduced to an impervious cord, whilst the foramen ovale and ductus arteriosus were both open. Dr. Farre gives the history of two similar cases, one of which died in a week, the other lived six months. In all these the muscular power of the right ventricle had become useless; in Dr. Hunter's case its cavity was nearly obliterated, and in both of Dr. Farre's a perforation of the inter-ventricular septum made the right a mere appendix to the left ventricle. The part which the ductus arteriosus bore here was important, for, open to pressure only at its aortic end, it must have supplied the place of the pulmonary artery, by conveying the blood in a retrograde course from the aorta to the lungs. The same thing occurs in a minor degree when the pulmonary artery is merely contracted at its orifice, If, on the other hand, the aortic orifice is contracted, so that the artery does not receive the due influence of the systole of the left ventricle, the pressure on the right end of the ductus arteriosus will be greatest, and a current will flow from the pulmonary artery to the aorta. Any obstruction to the circulation through the lungs would have a similar effect, and for the reasons which we have already observed to obtain in fœtal life.

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[*] *Farre*, op. cit. p. 30, 27, 28; *Meckel*, Tab. Anat. Path. Fasc. 1, Fig. 1 and 2: *Senac*, Traité sur la Structure du Cœur, t. ii. p. 404; *Dr. Hunter*, Medical Obs. and Inq., vol. vi. p. 291-99; *Corvisart*, sur les Mal. du Cœur, pp. 276, 293, 298; *Bartholinus*, Acta Hofniens. t. i. p. 100; *Abernethy*, Surg. and Phys. Essays; *Dr. Crampton*, Trans. Coll. Phys., Dublin, vol. i.; *Dr. Hope*, on Diseases of the Heart, p. 468.

Openings in the septum of the ventricle, when combined with decided contractions of either of the arterial tubes, we cannot but view as in most instances the effects of the latter; for it is a simpler idea, and one more consistent with the laws of development, to suppose that an obstruction, which, pathologically speaking, is of frequent occurrence, retains the current of blood in the course which it held in the early period of its formation, than to ascribe a perforated septum to some specific and inexplicable arrest in its natural development.

The most common combination of an open ductus arteriosus is, however, with considerable patescence of the foramen ovale; and we would still view this latter in the light of a cause. Any considerable direct communication between the auricles must, to some extent, frustrate the longer intercourse through the lungs; and from the blood passing thus directly in a venous state to the left side of the heart, two things affecting the balance of the circulation must result: 1. the left ventricle, not receiving its proper stimulus of pure arterial blood, does not contract with increased energy, as at the moment of birth it ought to do; 2. this defective force in the left ventricle occasions some stasis of blood in the pulmonary vessels; whence the pressure of the aortic extremity of the ductus arteriosus continuing to be less than at the right end, the blood persists to flow through it as before birth, and its canal is kept permanently open.

2. **Irregular Malformations.** — The next description of malformations are those which consist of a misplaced or erroneous position or attachment of parts in the heart, constituting the *qualitative* malformations of Meckel. Examples of transposition of the aorta and pulmonary artery are described by Farre, (Op. cit. p. 29); Langstaff, (Lond. Med. Rev. p. 83); and Baillie; (Morbid Anatomy, p. 36.) The subject of one lived five months and died of small-pox; the surface was cold and extremely susceptible, and the skin blue, with incessant cough in any posture but on the right side. During the eruptive fever there was increased heat only in the head, the limbs and body remaining cold. The valve of the foramen ovale was found perforated with five holes; the aorta sprung from the right, and the pulmonary artery from the left ventricle. In Mr. Langstaff's case the child lived ten weeks with similar symptoms, and here both the foramen ovale and ductus arteriosus were open. In two cases related by Sir Astley Cooper, the pulmonary artery communicated with both ventricles, and gave off the descending aorta; the ascending aorta rose from the left and divided into the innominata, and the left carotid and subclavian; the foramen ovale was also open.

A remarkable instance of malformation is described by Dr. Holmes in the first volume of the Transactions of the Medico-Chirurgical Society of Edinburgh. The subject was a young man aged 21, who had from childhood been affected with palpitation, dyspnœa, blueness of skin, pain about the heart, and frequent faintings, with cold limbs. The foramen ovale was found open, and the right auricle, instead of opening into the right ventricle, communicated with the left by a large aperture, which was furnished with a tricuspid valve. The auricle was enlarged to the capacity of a pint. The right ventricle gave off the pulmonary artery as usual, and must have received blood only through an opening in the left ventricle, immediately beneath the aortic valves.

The valves of the heart have been found in an unnatural state, which many pathologists have considered to be congenital. Laennec describes a union of the laminæ of the tricuspid and of the mitral valves at points near their extremities, but leaving apertures through which a finger might be passed. In the same case the semilunar valves of the aorta and of the pulmonary artery were also adherent to one another. Small, smooth, round, or oval openings are occasionally met with in the different valves, which may be regarded as congenital; and Laennec met with a case in which holes of this kind had converted the tricuspid valve into a mere net-work. There have been noticed other irregularities in the valves, such as an inequality in their size, and a superfluity in their number.

3. *Superfluous Malformations.* — The last order of malformations to be noticed are those consisting of excessive development. Well-described examples of these are not numerous, nor do they bear any remarkable feature. The heart has been found with supernumerary auricles and ventricles, and even double the natural number. Meckel describes instances of these double hearts, all having occurred in double monsters. (De Monstrosa Dupl.) Winslow met with one in a fœtus which was defective in the œsophagus and trachea. Andral has seen a heart with three auricles, and another with four ventricles. An appendicular auricle or ventricle is not uncommon: we have met with an instance of the latter. Supernumerary septa, partially or entirely separating portions of the different cavities, have likewise been described. The foramen ovale has been found closed in the fœtus (Vieussens sur la Structure du Cœur); and in one case of this kind there existed an unusual communication between the vena cava and pulmonary veins. Bertin quotes a case of a double arch of the aorta.

The pathological effects of malformations of the heart depend on two physical causes, an obstruction to the circulation, and an intermixture of venous with arterial blood. The first of these is probably the most important; for the latter, although decidedly injurious, does not appear to encroach so seriously on the functions of a body accustomed to its effects, as to prove fatal, unless when conjoined with material obstruction to the circulation. These two, moreover, produce and re-act on each other in a manner sufficiently interesting to merit a little consideration.

Some cases of single heart already noticed, prove that the free admixture of venous blood in the arteries is not incompatible with life, as the subjects lived for several days. There was in these cases, besides, some obstruction to the circulation, in the aorta, or in the pulmonary artery; the one being characterized by pallor, and the other by a blue discoloration of the skin: and it is a question whether, but for these impediments, life would not have been considered prolonged; for the simplicity of the moving power would prevent any of that loss of balance which is so frequent a cause of obstructed circulation in the double heart. This loss of balance, or undue action of one compartment of the heart, is an almost inevitable consequence of any malformation which causes a mixture of venous with arterial blood; and if it be great, it will generally aggravate the evil effects of the malformation; whence, in such cases, the obvious tendency to progressive disorder. In the greater number of instances the right side of the heart suffers more especially. Naturally its task may be said to be lighter in post-natal life than that of the left side, but the various congenital irregularities of mechanism fall heavy upon it; whence, according to the observations of Louis, it is almost always affected with dilatation or hypertrophy. Thus in perforation of the septum of the ventricles, as well as in the open state of the ductus arteriosus with a free pulmonary artery, the right ventricle has to contribute to the aortic circulation as well as to maintain the pulmonary, whence it gradually assumes a more muscular structure than the left ventricle. The right auricle may suffer in a similar way from an open foramen ovale; but as the contractile power of the auricles is but trivial in force, this malformation will scarcely produce great disorder without the addition of another cause. Such a cause is any obstruction to the circulation though the lungs; for example, a contraction of the pulmonary artery. Where this exists, the blood will not proceed so fast as it arrives; there is consequently an accumulation in the auricle, with an unequal pressure and a flow through the foramen ovale. But in the history of cases described, we find the worst complication of this malformation is with an imperfection in the tricuspid valve. This is illustrated in Corvisart's case of the postilion. (Op. cit. p. 279.) The man, aged 57, said to have been previously healthy, was attacked with blueness of skin, palpitation, dyspnœa, &c. after injuries from a carriage passing over him, and a violent blow on the epigastrium. From this time he suffered in various degrees, and in four years sank under the usual symptoms of valvular disease of the heart, accompanied by discoloration of skin. The right auricle and ventricle were found greatly dilated and thickened; the left auricle was also dilated, but the left ventricle was both thinner and smaller than natural. The foramen ovale was more than an inch in diameter, and the right auriculo-ventricular opening so much dilated as to admit four fingers, whilst that on the left side only admitted one; the mouth of the aorta was likewise contracted. Laennec ascribed the open state of the foramen ovale to this accident; but we think it more probable that this was congenital, and, as is often known to be the case, harmless in its effects until the period of the accident. The violence may have occasioned a rupture or dilatation of some portion of the tricuspid valve, so that it ceased to close the auriculo-ventricular orifice, whence regurgitation into the right auricle, and such pressure as to drive the blood through, and in time greatly to dilate the foramen ovale. We have said that an imperfect state of the tricuspid valve is the worst disorder of the mechanism that can complicate itself with an open foramen ovale; and the reason is, in addition to what we have just remarked, that the impulse of the right ventricle is propagated through the foramen ovale to the left auricle, and there opposes the course of the blood, which, during the systole of the ventricle, ought to flow into it from the lungs. It may be thus seen why in the above and in all similar cases on record, there has been an excessive oppression of the respiratory function. The contraction of the left ventricle and aorta was obviously the effect both of the small quantity of blood which the disordered mechanism of the right ventricle could propel into it, and also of the unstimulating quality of that blood.

We may remark, in conclusion, that every kind of malformation which leads to a mixture of venous with arterial blood, must, as we have before explained, occasion an obstructed circulation through the lungs, and consequently add to the labour of the right ventricle. Bertin ascribes the frequent occurrence of hypertrophy in the right cavities of the heart, in cases of malformation, to the more stimulating influence which arterial blood obtaining entrance through the unnatural opening, exercises upon them. (Traité des Mal. du Cœur, p. 436.) Laennec thinks, however, that the pathological change results from the necessity imposed on the right cavities (naturally the weakest) of a more energetic action, in order to resist the impulse of blood flowing from the left side. (Dr. Forbes's Translation, p. 630.) This opinion is more clearly supported by Dr. Hope, in his valuable work on Diseases of the Heart (Op. cit. p. 463), who remarks on the opinion of Bertin, that the obstructions in the pulmonary artery which so frequently prevail, would throw the current too much in the opposite direction, from right to left, to permit the entrance of arterial blood into the right cavities; and he considers that the greater labour thrown on the right ventricle in supporting the weight of the aortic circulation, is a sufficient cause for the changes in question. The dilatation in the same cavities is the generally acknowledged effect of over-distension; and Dr. Hope considers that this always depends on some obstruction to its course on the left.

M. Louis gives the following numerical comparison of the pathological changes in nineteen cases of congenital malformations. (Archives de Méd. tome iii. Nov. and Dec.)

Contraction of the orifice of the pulmonary artery in ten; of the aorta in only one. Dilatation of the right auricle in eighteen, five of which were with hypertrophy, and two with attenuated parietes. Right ventricle simply dilated in five; simply hypertrophied in six; dilated and hypertrophied in four. Left auricle dilated in eight; hypertrophied in three. Left ventricle dilated in four; hypertrophied in two. Tricuspid valve more frequently diseased than the mitral, but neither often.

Symptoms. — Malformations of the heart sometimes give rise to very prominent and well-marked symptoms, whilst in other instances they have only been discovered by the scrutiny of the anatomist after death. When the disease is extensive, and particularly when combined with hypertrophy of one of the cavities or obstruction in some of the orifices, some or other of the following signs are always present;—discoloration of the skin, varying from a slight reddish purple tinge to a deep purple or livid colour, especially affecting those parts which are naturally red, as the lips, tongue, fauces, and nails, which are sometimes almost black;—considerable diminution of the superficial heat, with great sensibility to cold;—palpitation of the heart coming on in paroxysms, especially after exertion or mental emotion;—the pulse very variable, but generally irregular; occasionally syncope; — in children convulsions;— respiration habitually short and difficult, with fits of severe dyspnœa, which sometimes occur periodically, and after tormenting the patient for a variable period, are terminated with sighs and yawning; — torpidity of bodily habit, with irritability of temper;—severe pain of the head, vertigo, and defective vision;—atrophy, and a disposition to hemorrhage.

It was, until lately, a general opinion that the blue discoloration of the skin, or *cyanosis*, as in its greater degrees it is termed, is a characteristic sign of malformations of the heart which occasion the mixture of venous with arterial blood. This has been called in question in consequence of some cases described by Fouquier, Meckel, and Breschet, in which there existed malformations of this description without cyanosis; and on the other hand an example of cyanosis reported to the Academy of Medicine by Dr. Mare, where no organic disease of the heart, congenital or otherwise, was discovered on dissection. Another opposing argument has been urged by Fouquier, founded on the alleged fact that the blood in the arteries of the fœtus is dark without there being any blueness of the skin. Bertin (Mal. du Cœur, p. 437) and Ferrus (Dict. de Méd. art. *Cyanose*) have accordingly taken up the idea that the mixture of venous with arterial blood has no necessary connection with cyanosis, but that a stagnation of blood in the capillaries, generally dependent on an obstruction to the circulation in the heart, is the universal cause of the blue discoloration in question: and that the presence of this sign in malformations arises only from the impeded state of the circulation which generally attends them. This view appears to us at least quite as inconclusive as the former one; for we know that the circulation is impeded in almost every considerable disease of the heart or lungs, often without any cyanosis, and never (except, according to Laennec, in emphysema of the lungs) with that degree which is seen in congenital malformations. Moreover, the cases before quoted (from Farre, Langstaff, and Baillie) prove that in some most remarkable examples of constant discoloration of the skin, there were no apparent obstructions to the course of the blood.

We confess that we are still inclined to prefer the old opinion, modified in some degree according to the objections which the foregoing facts bear against it. With respect to Fouquier's argument, it may be stated that the fact of the blood in the fœtal arteries being dark is denied by later writers;* and it is familiar to accoucheurs that a newly-born infant is often livid or purple, till it cries; crying is a proof of complete respiration, and then this colour gives place to a general redness. The absence of cyanosis in the cases of malformations before named was conjoined with a general pallidity of the surface; and it would seem, therefore, that defect of blood in the capillaries was the reason of the absence of a dark colour. It must be remembered that in many cases we often see the countenance and surface so pale that the colour of the blood obviously does not affect them; and it is not to be expected that blueness of the skin should be apparent in a greater proportional number of cases of malformation with free communication between the cavities, than is the redness of the same parts visible in other subjects. Dr. Paget well observes that, "as the colour of any organ is partly derived from the blood it contains, a change of the colour of the blood must affect the colour of the organ;" and we can conceive no cause of this change more efficient than one which throws black blood into vessels which naturally contain it of a visible red. To assert that malformations are the only source of cyanosis would be to take an occasional for a proximate cause: in the collapsed stage of cholera, in asphyxia, and in emphysema of the lungs, we find a similar discoloration of the skin; and in these the same proximate cause must be recognised, the presence of black blood in vessels which ordinarily convey red. In these cases, as in the former, and as also in the healthy state, an additional obstruction, the effect of posture, exposure, or exertion, will be followed by a still further injection of the capillaries, and where an ordinary subject would become florid and flushed, these assume a deeper and more livid hue.

In most of the cases accurately described, a diminished temperature with chilliness of the surface has been remarked in those malformations that are attended with blueness of the skin. Dr. Farre submitted some of these to the test of the thermometer, and found the internal heat to be as usual, but that of the surface depressed in various degrees according to the exposure of the part. In some instances, when a limb has been exposed, it has been observed to become quite cold and livid. The patients commonly like to approach the fire at all seasons, and require an unusual quantity of clothing; when exposed to cold, especially if accompanied with wind, they sometimes become quite torpid and incapable of exertion. This is well instanced in a case described in Dr. Hope's work. (Op. cit. p. 470.) [See, especially, Dr. Pennock's Amer. edit. p. 449, Philad. 1842.]

The palpitation, syncope, and dyspnœa may generally be said to be more frequent than in any ordinary disease of the heart; but the paroxysms are not often so severe as in the advanced and aggravated forms of valvular disease; nevertheless, when verging towards a fatal termination, they scarcely differ in symptoms from valvular disease, with which in fact they are frequently complicated. The greater blueness of skin, when present, is the most decisive distinction. It would appear that the intermittent form of the dyspnœa depends here, as in other diseases of the heart, in some measure on a sympathethic spasm, excited in the bronchial tubes by the engorgement of the right cavities of the heart. The relief of these exacerbations by deep sighing and yawning, which favour the oxygenation of the blood and its transmission through the lungs, is more remarkable than in other asthmatic diseases. The torpidity of habit, as well as the vertigo, acute headach, and defective vision frequently present, must be ascribed to the influence of the venous blood circulating through the brain; and the same circumstance renders the nutritive process inactive, whence the subjects are commonly thin and slender.

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* Bostock's Physiology, vol. ii. p. 109. Holland on the Physiology of the Fœtus, &c. p. 154. See also, an excellent inaugural dissertation on Malformations of the Heart, by Dr. Paget, Edinburgh, 1831.

We have no reason to think that malformations of the heart are characterized by any distinctive physical signs; but the accompanying organic changes may be recognised by their usual signs, which are ably stated elsewhere. (See Heart, Auscultation, Hypertrophy, Dilatation, and Diseases of the Valves of the.) Contractions of the arterial orifices would be attended with a hissing, grating, or bellows-murmur during the first sound; and a similar sound, more profound or remote, would probably accompany regurgitation into either auricle. In a case related by Dr. Hope, in which there was a perforation through the septum of the ventricles with a contraction of the pulmonary artery and open foramen ovale, there was a loud, superficial, hissing, bellows-murmur accompanying the first sound. Dr. Hope considered the superficial character of this sound to indicate an obstacle in the passage of blood from the right ventricle. It is probable that a free communication between the ventricles might occasion a murmur with the first sound; but an open foramen ovale can scarcely be expected to have any such effect, as the flow of blood through it, if there be any, would scarcely be forcible enough to become sonorous. Corvisart (Op. cit. p. 276) perceived, in one instance, a peculiar *bruissement* in the region of the heart, sensible to the hand. One of the aortic valves was absent.

Treatment.—Although it is obvious that the cure of malformations is beyond the reach of art, yet, as we have seen that their fatal tendency depends greatly on their complication with other pathological conditions, the treatment which is adapted to retard the progress of these will generally delay the fatal subversion of the functions to which both, when united, inevitably proceed. Any thing which causes an additional embarrassment to the breathing, or in any way injures the balance of the circulation, will not only produce a temporary disorder in fits of palpitation or asthma, but will permanently aggravate the organic mischief by increasing the attendant dilatation or hypertrophy, and by favouring the habitual passage of blood through all devious and unnatural channels. Hence it becomes of the utmost consequence to watch those patients who are supposed to labour under congenital disease of the heart, and to keep their functions as near as possible on a balance; forbidding every sudden or violent exertion or mental excitement; enjoying a moderately nutritive but light diet of the most easily digestible kind; carefully excluding from cold a frame so susceptible to its effects; and, if necessary, aiding the excretory functions by the occasional cautious administration of appropriate medicines. The defect of the proper arterial quality of the blood is probably more or less felt by all the organic functions; in none, perhaps, more than in the secretion of urine, which is generally turbid and scanty. Hence the artificial aid of diuretics, especially colchicum, with nitre and other salts, may prove serviceable. Dr. Farre supposes that the skin may be made in some measure to compensate for the defective action of the lungs in the process of arterialization; and although the experiments of Magendie and others scarcely permit us to believe that the process of oxygenation goes on at this surface, it is probable that, by keeping it in a more perspirable state, more relief may be afforded to the pulmonary and cardiac congestion than by any other measure. The warm bath, partial or general, has been found of great effect in relieving the paroxysms of palpitation and dyspnœa occurring in these complaints; and the application of warmth by gentle frictions with hot flannels is a measure of some utility, and one which may very often be resorted to. In individual cases relief may often be procured during the paroxysms by particular postures; it is important to try to discover these in each case, but no general rule can be laid down.

From what we have before remarked, it may be deduced that malformations may occasionally take their origin at the time of birth from a defective state of the respiration; and we do not deem it quite useless to suggest the expediency of watching this function in the new-born infant, and of exciting it, if any lividity of the skin should show it to be imperfect, through the various channels of sympathy that are familiar to physiologists, such as by sprinkling the face and neck with cold water, or tickling the nostrils with a feather; or, if these fail, by artificial inflation of the lungs.

C. J. B. Williams.

[HEART, (NEURALGIA OF THE). See Angina Pectoris.]

[HEART, (POLYPUS OF THE). *Polypous, polypiform or fibrinous concretions in the heart.* In ordinary cases of death, the fibrinous portion of the blood is found coagulated in the heart, and either confined to the cavity in which it is chiefly met with, or extending to the arteries proceeding from it. At one time, these concretions were considered to be morbid, and were termed *polypi*, in consequence of their shape. They may take place before death, and, at times, interfere with the circulation of the blood through the heart, so as to give rise to physical signs, which may cause their presence to be suspected. They are, doubtless, owing to impeded flow of blood through the pulmonary artery or the aorta, the consequence of which is, retardation in its flows through the cavities of the heart, and consequent coagulation. Wagner (*Elements of Physiology*, translated by R. Willis, part 2, p. 267: Lond. 1842,) affirms, that the absence of blood corpuscles in their interior is an evidence of their formation some time prior to dissolution; the columnæ carneæ and chordæ tendineæ acting upon the blood in the same manner as the switch acts upon freshly drawn blood, when we beat it to separate the fibrin from it. Many cases have been published in which such impediment to the cardiac circulation has been suspected. At a late clinical lecture at the Philadelphia Hospital, the writer exhibited to the class a semi-organized fibrinous concretion in the right ventricle, the existence of which he had foretold before dissolution, owing to the sound of impeded transmission of blood through the heart, in a person dying of pleuro-pneumonia; and a similar case, occurring in his service in the Baltimore Infirmary, was published by Dr. M'Neal, (*American Med. Intelligencer*, July 1, 1837, p. 125.)

It appears to be generally admitted at the present day, that blood, under special circumstances, may become organized after coagulation in the vascular system. No one denies the plastic or formative powers possessed by the liquor sanguinis of the blood; and it is not difficult to comprehend that blood itself may be endowed with similar properties.

Diagnosis.—The diagnosis of polypiform concretions in the heart cannot be easy. It has been conceived, however, that if, along with an increased, irregular, and confused action of the heart, there be a sudden and excessive aggravation of dyspnœa, without any obvious cause, the patient being in agony from an intolerable sense of suffocation, remaining restless and distressed till death, with cool surface and extremities, and a livid countenance, occasionally accompanied with nausea and vomiting, the presence of a fibrinous concretion may be suspected. Many of these phenomena, however, are the usual precursors of dissolution; and, as elsewhere remarked, (*Practice of Medicine,* 2d edit. i. 481,) it is not clear what can be the connection between this state of the heart and the affection of the stomach. The nausea and vomiting can only be regarded as an accidental circumstance. Occasionally these concretions are the cause of death by blocking up one of the apertures of the heart.

Treatment.—The diagnosis being so difficult, it is not more easy to suggest an appropriate treatment. When positively diagnosticated, indeed, the affection can only be treated according to the phenomena that present themselves. There can be no mode of reaching the mischief. Alkalies have been advised from their property of diminishing the tendency of the blood to coagulate; and the borate of soda has been considered by Dr. Copland the most effective agent in preventing the concretion of fibrin, and in dissolving it when concrete. Little or nothing can, however, be expected from them in this affection.

ROBLEY DUNGLISON.]

HEART, (RUPTURE OF THE,) [*Cardiorrhexis,*] may be either complete or partial. The rupture is said to be complete when the walls of the heart are perforated or torn through; it is said to be partial or incomplete when it is confined to the tendinous chords or fleshy pillars of the heart.

Complete Rupture.—The immortal discoverer of the circulation was the first to describe this lesion of its central organ. (De circulat. sang. exercitat. 3.) Morgagni, who himself fell a victim to the disease, and other pathologists, both in this country and on the continent, have since recorded a considerable number of similar cases, and have clearly shown that not a few of the cases of sudden death, usually attributed to an apoplectic seizure, are in reality caused by rupture of the heart. But although the disease has now in a great measure lost the interest of novelty, yet its investigation has acquired a still stronger claim on the attention of the physician, from the very fact of its occurrence being now no longer a matter of curiosity. We have ourselves witnessed two cases of rupture of the heart, occurring within the same year, in the Dublin House of Industry; and M. Rostan observed three similar cases during the winter of 1816, and two more in the space of a fortnight, in the year 1820.—Still, however, the lesion may be considered as one of comparatively rare occurrence.

The table on the opposite page, which we have drawn up from the most accurately reported cases that we have been able to select, may serve to illustrate some of the most interesting points connected with this formidable lesion, such as the relative frequency of its occurrence in the different parts of the heart, the sex and age of the individuals, the causes of the lesion, remote and proximate, and the symptoms which precede and follow the event.

From this table it will be seen that the occurrence of this formidable lesion is almost exclusively confined to extreme old age, and that the number of males who fall victims to it is much greater than of females, the proportion being sixteen to nine, or nearly as two to one. As regards the situation of the rupture, it appears that of the *twenty-five* cases recorded, the lesion occurred *nineteen* times in the anterior surface of the left ventricle near the apex, *three* times in the right ventricle, *twice* in the right auricle, *once* in the septum, and in two instances there were more ruptures than one. The observations of Bayle likewise confirm these results as to the relative frequency of the rupture in these different situations. Of nineteen cases of rupture of the heart collected by this author, *fourteen* occupied the left ventricle near its apex, *three* the right ventricle, *one* the apex, and one the septum. (*Meckel,* vol. ii. note.) So that, from his observations as well as our own, it results that the left ventricle near its apex is, beyond all comparison, the part of the heart most frequently ruptured, the right ventricle comes next in order, and lastly the auricles and septum. This difference in the relative frequency of the rupture in their different situations, may, we conceive, be accounted for by referring to those pathological alterations which usually precede and induce the rupture of this organ. We are aware that several cases have been recorded of rupture of the heart caused by some violent mental emotion or physical exertion, a remarkable instance of which occurred some years since in Dublin, when a gentleman, on reading in a newspaper the death of his only son at the storming of Bergen-op-Zoom, instantly fell from his chair, and expired without a moan. Still, however, mental emotions, however powerful, can scarcely be considered capable of producing so formidable an effect, unless where the heart had been predisposed to rupture by some organic lesion or degeneration of tissue; and therefore, while we do not deny the possibility of rupture of the heart arising in the same way as rupture of the uterus, from the inordinate action of its muscular fibres, we believe that

Table of Twenty-five Cases of Rupture of the Heart, collected from various Authors.

Author's Name.	Sex.	Age.	SYMPTOMS.		CAUSE.		Situation of Ruptures.
			Premonitory.	Consecutive.	Proximate.	Remote.	
Adams, in Dublin Hospital Reports	Female	60	Dyspepsia	Sudden death	Straining to vomit	Softening and fattiness	Anterior wall of left ventricle
Ditto	Male	64	Cerebral apoplexy	Ditto	Straining at stool	Ditto	Ditto
Bertin, Traité des Maladies du Cœur	Ditto		Not mentioned	Ditto	Leaping out of a window	Not mentioned	Right auricle
Ditto	Ditto		Previous health good	Ditto	Vomiting after supper	Prodigiously fat	Ditto
Bland, in Bibliotheque Médicale	Ditto	86	Pain of chest and oppression	Ditto	Spontaneous	Ramollissement	Anterior wall of left ventricle near apex
Ditto	Ditto	58	Dyspepsia	Ditto	Straining to vomit	Ditto	Anterior wall of left ventricle
Ditto	Ditto	76	Previous health good	Ditto	Spontaneous	Ditto	Ditto
Ditto	Ditto	80	Ditto	Ditto	Ditto	Ditto	Ditto
Bohnius, De Renunciatione Vulnerum	Ditto		Ditto	Ditto	Ditto	Not mentioned	Ditto
Ditto	Ditto		Not mentioned	Ditto	Ditto	Ulceration	Septum ventriculorum
Crampton, case unpublished	Ditto	80	Previous health good	Ditto	Mental emotions	Loaded with fat	Right ventricle
Ferrus, in Archives Générales	Ditto	60	Pain in præcordia and Dyspnœa	Ditto	Spontaneous	Ramollisement	Anterior wall of left ventricle
Harvey, de Circulatione Sanguinis	Ditto		Organic disease of heart	Ditto	Ditto	Not mentioned	Ditto
Morgagni, De Causis, etc. Morborum	Female	75	Headach and flatulence	Ditto	Ditto	Heart loaded with fat	Ditto
Ditto	Ditto	Old	Palpitations	Ditto	Ditto	Ulceration	Ditto
Ditto	Male	65	Rheumatic pains	Ditto	Ditto	Ditto	Ditto
Morand, in Mém. de l'Acad. Royale	Ditto		Not mentioned	Ditto	Ditto	Ramollissement	Ditto
Ditto	Female	Old	Ditto	Ditto	Ditto	Ulceration	Right ventricle
Nichols, in Philos Trans. vol. lii.	Male	77	Ditto	Ditto	Straining at stool	Not mentioned	Ditto
Rostan, in Nouveau Journal de Méd.	Female	70	Organic disease of heart	Ditto	Spontaneous	Thinning of the part	Anterior wall of left ventricle
Ditto	Ditto	75	Previous health good	Ditto	Ditto	Ditto	Ditto
Ditto	Ditto	78	Slight catarrh	Ditto	Ditto	Ditto	Ditto
Ditto	Ditto	74	Acute pain in præcordia	Ditto	Ditto	Ditto	Ditto
Townsend, in Dublin Hospital Reps.	Ditto	88	Previous health good	Ditto	Ditto	Ramollissement and thinning	Ditto
Ditto	Male	84	Ditto	Ditto	Ditto	Ditto	Ditto

such cases are excessively rare, and that in the great majority of instances which do not arise from external injury, the organic structure of the fibres is diseased before their substance is lacerated.

The alterations of structure which usually precede rupture of the heart, are ulceration, softening, or a disproportion in the thickness of the muscular parietes, arising either from atrophy of the part thinned, or hypertrophy of the other parts of the walls of the cavity, or from both these alterations combined.

Of these morbid changes, some, as ulceration and softening, may attack any part of the heart external or internal; and accordingly the ruptures, or rather perforations, which these morbid alterations give rise to, are found to occur with nearly equal frequency in the right and left ventricles, and in the auricles, whereas those cases of rupture arising from a disproportion in the thickness and strength of the walls of the heart, almost invariably occur in the left ventricle, about half an inch from the septum, and the same distance from the apex. Laennec and Bertin, whose authority ranks deservedly high on such subjects, are both of opinion that perforating ulcers are decidedly the most frequent cause of the heart's rupture, but we cannot reconcile with this opinion the fact that fully three-fourths of the cases of rupture on record have occurred precisely in one determinate point, while the ulcers, which are supposed to precede them, evince no predisposition for that particular part of the heart. It is true that a large proportion of those ruptures which occur in the auricles or in the right ventricle, is caused by perforating ulcers commencing generally on the internal, occasionally, too, on the external surface of the parietes, and burrowing through their substance; but in those more numerous instances where the rupture occurs on the anterior surface of the left ventricle near its apex, the lesion is, in most instances, produced by the parietes having been previously rendered thin in that point, while their thickness was increased towards the basis.

The reason why this is so may, we conceive, best be understood by considering, that although the parietes of the right ventricle and of the auricles are considerably thinner than those of the left ventricle, and consequently the parts which would, à priori, be supposed most liable to rupture, yet as they are nearly of the same uniform thinness throughout, the force of their contractions, as also their power of resistance, is equably divided, and operates equally on every point of their surface; whereas the walls of the left ventricle are naturally thinner near the apex than towards the basis, and this inequality is occasionally rendered still greater by disease, especially by that form of hypertrophy by no means uncommon in advanced life, in which the walls of the left ventricle are more or less thickened towards the basis, while they retain their ordinary thinness near the apex, or are even rendered thinner than natural. M. Rostan, who has particularly described this form of hypertrophy, has likewise enumerated four cases of rupture arising from it. According to this author, the disproportion is, in some cases, so great that the muscular walls of the left ventricle measure fifteen or even eighteen lines in thickness towards their bases, while near the apex they are scarcely two lines thick. This local thinning of the muscular parietes is frequently accompanied with, and as it were compensated by a thick coating of fat, which is sometimes so considerable as to have arrested the principal attention of several distinguished pathologists, who, accordingly, did not hesitate to refer the rupture of the organ to this hypertrophy of the adipose tissue, which, in our opinion, was no otherwise concerned in producing the rupture than as it coincided with the atrophy of the subjacent muscular substance.

Whenever the disproportion which naturally exists between the thickness of the walls of the left ventricle near the apex and towards the basis is rendered still greater, (as in the form of hypertrophy just alluded to,) or when, their relative proportions remaining unchanged, the force of cohesion is generally diminished throughout their muscular structure, as in the case of general softening of that organ;* the apex of the left ventricle being the point which sustains the greatest shock in proportion to its powers of resistance, yields to the distending force; and accordingly we find that aneurismal pouches, as well as ruptures, occur most frequently at this very point, namely, at the anterior surface of the left ventricle, about half an inch from the apex, and the same distance from the septum.

It is not our intention to enter into a minute description of those morbid changes of structure which we have enumerated as the ordinary precursors of rupture of the heart, as they have already been fully discussed in the respective articles assigned them in this work: for our purpose it is sufficient to observe, that when the heart is predisposed to rupture by any of these morbid alterations, the slightest exciting cause is often sufficient to induce the fatal catastrophe. Of the twenty-five cases we have collected, there were eighteen in which no immediate cause of rupture could be assigned—the ordinary action of the heart being of itself sufficient to overcome its feeble powers of cohesion: of the two cases which fell under our observation, one died suddenly while chatting with his messmates; and the other as instantaneously while telling her beads in chapel. In three of these cases the act of vomiting was sufficient to cause the rupture; and in two instances it was occasioned by straining at stool. In one case already alluded to the rupture was caused by violent mental emotion; and we remember to have read of a similar event occurring in the person of Philip the Fifth of Spain, on hearing of the loss of the battle of Piacenza; and lastly, in one of the cases the accident was produced by external violence, the individual having jumped out of a high window.

From whatever cause the rupture proceeds, its occurrence is generally followed by immediate death; but in some rare cases life has been prolonged for several days after the accident, and the perforation has in these instances, we are informed, been found plugged up with a coagulum of fibrine. We have not ourselves met with an instance of this favourable termination of the lesion, nor have we been able to discover a single case of the kind in the medical annals of this country. Still we are not prepared to deny the possibility of such an occurrence, as the annals of surgery furnish abundant proofs that the heart may be perforated, and yet that the individual may survive the accident for many years. We might quote many cases in point from the works of surgical writers, but prefer confining our observations to cases of spontaneous rupture. M. Cullerier saw an instance of rupture of the left ventricle, in which the fissure was plugged up with a firm fibrinous concretion; and M. Rostan relates that a woman, aged seventy-four, who had suffered for fourteen years from palpitations, accompanied with excruciating pain in the left side and in the epigastrium, was seized with an attack of indigestion and vomiting, during which she expired suddenly, just as she was congratulating herself on getting over the attack. On dissection, the pericardium was found attached to the heart by albuminous bands, in different stages of organization; an irregular fissure, nearly an inch and a half long, was also discovered on the anterior surface of the left ventricle, and to the left of this fissure the substance of the heart seemed destroyed for half an inch in length and half a dozen lines in diameter: this loss of substance was replaced by a firm concretion, which appeared incorporated with the surrounding tissue of the heart. In the neighbourhood of these changes, the walls of the heart were remarkably thin, and were as remarkable for their thickness every where else. M. Rostan adds, that from the appearance of the cicatrix, he had no doubt that it was the mark of a former rupture, and probably of several years' standing.

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* M. Blaud, who has published a highly interesting memoir on this subject, regards the softening of the heart's substance as the result of its prolonged action, and as a frequent, if not a necessary consequence of old age; and this degeneration he considers the essential cause of the ruptures which take place in extreme old age, and proposes to designate by the term of "déchirement sénile."—*Bibl. Médicale.*

From these cases and others of a similar character, we are justified in concluding that, in the event of rupture of the heart, there is a possibility of the aperture being closed by a coagulum, and of this coagulum becoming the medium for the formation of a true cicatrix: this favourable event is most likely to occur when the rupture is small, situated obliquely, and traversed by fibres attached to the ruptured surfaces; the cicatrix thus formed would, no doubt, receive additional strength from the formation of adhesions between the heart and pericardium in the immediate neighbourhood of the injury. This favourable termination is unfortunately of such rare occurrence, that the disease may be reckoned among those which are the most immediately fatal.

The premonitory symptoms of this lesion are, as might be expected, as varied as the conditions of the organ which precede its rupture. "Of the individuals," says M. Andral, "who died under my care in consequence of rupture of the heart, some had for a long time previously manifested the usual symptoms of organic disease of that organ; others had never betrayed any symptom of disease, either of the heart or large vessels; and others again had complained occasionally of uneasiness or pain in the præcordial region, unattended with any other morbid symptom." In most instances the attention of the physician is first awakened by the sudden and unexpected death of the individual; and in not a few cases it is only on dissection that the true nature of the case is discovered, when on removing the sternum the pericardium is seen presenting a pale bluish tint, and when opened is found more or less distended with blood; most commonly only one rent can be discovered in the heart, but in some cases as many as five or six fissures have been found; in such cases the ruptures are usually the effects of ulceration.

The subject of treatment may, unfortunately, be dismissed in a few words, for as we cannot anticipate the occurrence of this lesion, or recognize its existence after it has occurred, we cannot, it is evident, know when to apply the appropriate remedies; which should, in the first instance, be directed to the removal of those morbid conditions of the heart which predispose it to rupture; and in the second, (after the accident has occurred without producing immediate death,) to support the nervous system under the violent shock it has received, and at the same time to restrain the inordinate action of the heart, with the view of moderating the hæmorrhage and favouring the formation of a coagulum.

Besides the species of rupture just described, the heart is liable to another, which for contradistinction has been termed partial or incomplete: in this latter form of the disease the rupture is seated in the chordæ tendinæ or in the columnæ carneæ.

This species of rupture is, we believe, of more frequent occurrence than the preceding, though, in consequence of its not always causing such violent symptoms during life, or presenting such striking appearances on dissection, its existence is often overlooked. M. Corvisart, who first described this lesion, relates three cases of the chordæ tendineæ being torn across during violent fits of coughing; a sudden and intense feeling of suffocation immediately followed, and terminated in exhibiting all the usual symptoms of disease of the heart. Laennec, Bertin, and Bouillaud, have likewise published cases of this species of rupture, and a very interesting case of the kind is fully detailed by Dr. Cheyne in the Dublin Hospital Reports. We have ourselves met with three instances of one or more of the tendinous cords being torn across; in those cases we have seen, the lesion was found in persons labouring under pulmonary consumption. It does not appear that this species of rupture occurs more frequently in one ventricle than in the other. In some instances the tendons appear to be ruptured or torn from their attachments by a violent muscular effort, and do not exhibit any appearance of previous disease, but more frequently the ruptured extremities present unequivocal marks of the ulcerative process by which the solution of their continuity was effected; in two instances we have seen small globular vegetations attached to the ruptured tendons.

The symptoms of this lesion depend, in a great measure, on the extent and seat of the injury: when only one of the tendons is ruptured, the circulation is in general but slightly deranged; we have found two of the tendons severed in their centre by ulceration where no symptom of any derangement of the heart's action was exhibited during life; the individual was in the last stage of phthisis; but when all the tendons which are implanted into one of the valves are ruptured across, the valve, being no longer retained in situ, is allowed to flap backwards and forwards, and its valvular office is consequently destroyed altogether. The following observations, abridged from the case related by Dr. Cheyne, will serve to illustrate the formidable symptoms which are produced by this violent derangement of the heart's action. "A musician, ætat. thirty-four, was suddenly seized with acute pain in the region of the heart, so violent as to render him perfectly frantic,—the pain occasionally intermitted for some days. A month after the first attack, the stroke of the heart was indistinct and tremulous, and appeared to extend over the whole of the left side of the chest, from above the clavicle to below the scrobiculus cordis, without being more distinct at any one point than at another. Pulse 148—unequal, irregular, and indistinct—complexion of a leaden colour—countenance bloated—his eyes staring wildly—memory impaired—inability to lie down. The disturbance of the vital functions was wonderfully increased by walking even a few paces, and while the exertion increased the dyspnœa, it gave strength and distinctness to the stroke of the artery—death ensued without a struggle. Besides other morbid appearances, which it is unnecessary to enumerate here, the parietes of the left ventricle were found thickened, their internal surface much inflamed—several irregular excrescences were attached to the mitral and semilunar valves. The chordæ tendineæ, which connected the larger portion of the mitral valve to the wall of the left ventricle, were torn off just at the point of their insertion into the edge of the valve; four of these ruptured tendons hung loose into the ventricle.

Between the extensive lesion which occurred in this case, and the formidable symptoms resulting from it, and the rupture of only a single tendon, with its comparatively trifling effect on the heart's performance of its functions, several intermediate degrees of rupture may occur, each of which would, no doubt, be attended with symptoms of proportionate severity. M. Laennec frankly admits that these various kinds of rupture can at most be suspected, but cannot be certainly recognized by any positive signs. The only stethoscopic phenomenon which we could observe in a case of rupture that we had an opportunity of examining, was a confused tremulous pulsation, which it was impossible to analyse; and we have been informed by Dr. Stokes, that a similar kind of pulsation, extending over the whole cardiac region, was the only stethoscopic indication that he could detect in a case where, after death, he found the tendons of the mitral valve ruptured.

RICHARD TOWNSEND.

HEART, (DISEASES OF THE VALVES OF THE)

—The valves and chordæ tendineæ of the heart consist of fibrous tissue interposed between a production and reduplication of the lining membrane of the organ. The fibrous tissue is prolonged from a dense, whitish zone of the same, which encircles each of the orifices of the heart, and is, as it were, the tendon or point of attachment into which the muscular fibres of the organ are inserted. The lining membrane of the heart, according to Bichât, approximates closely in character to serous membranes: the valves, therefore, may be said to consist of fibro-serous tissue. This tissue in general, is remarkable for its proneness to cartilaginous and osseous degeneration; whence we derive an explanation of the fact, that the valves and orifices of the heart are frequently affected with these degenerations, while the cavities, where they are invested solely with the lining membrane, are in a great measure exempt. Though disease occupy a valve universally, it stops abruptly where the serous membrane is continued from the circular zone, or the extremities of the chordæ tendineæ, upon the muscular substance. In a few rare instances it advances farther; but we have never seen it attack the membrane on the muscular substance without its being connected with, and apparently propagated from disease of the valves.

It would appear that the disease is more dependent for its origin on the fibrous, than the serous tissue; for, where the former is most abundant, namely, at the base and the free margin of the valves, cartilaginous and osseous depositions are the most frequent and extensive. The depositions appear, indeed, to originate in the fibrous tissue exclusively; for it is common to find the valves encumbered with large masses of cartilage from which the internal membrane can be peeled off in its natural thin and transparent state. In these cases the surface of the morbid deposition is smooth and equable; and it is seldom until it becomes corrugated, rugged, and knotty, that the internal membrane is implicated in the disease. Calcareous depositions in the same way, seem always to commence underneath the membrane. In one case under our care, in which two rings of bone as thick as writing quills encircled the left orifices of the heart respectively, the membrane was stretched like a blue film over the whole of the aortic, and the greater part of the mitral ring.*

Valvular disease is much more rare on the right, than on the left side of the heart. Bichât, indeed, denied its existence at all in the former situation, but his opinion has been fully disproved. Morgagni, Vieussens, Hunauld, Horn, Cruwel, Corvisart, Burns, Bertin, Louis, Laennec, have all met with instances of disease of the right valves. Dr. Latham thinks that in one-third of the cases in which he has seen disease of the left valves, it has existed in the right also. We have notes of eight cases in which it existed in the right, and can recollect several others. In six of the eight the left side was simultaneously affected, and generally to a much greater extent; but the proportion which the whole number mentioned bears to the cases that we have seen of disease on the left side, is less than that indicated by Dr. Latham, not exceeding, we think, one in four and a-half to five.

[In a subsequent work, Dr. Hope thus expresses himself: "Since 1831, I have reason to believe, from the examination of a vast number of cases of valvular disease, mostly without, but occasionally with dissection, that the proportion of affections on the right side, as compared with the left, is very much smaller than I have specified above. I cannot state, numerically, the exact proportion, as I have not leisure at present to analyze 10,000 cases, which I calculate to yield about four per cent., or 400 cases, of valvular disease; but my general impression is, that, out of the 400, I have not, at the utmost, met with twenty cases of disease of the right valves,—which would only be five per cent., or one in twenty. Dr. Clendenning has met with about one in sixteen, out of 100 cases, as exhibited in the following statement, with which he has obligingly favoured me;

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* For the lesions of the valves here described, see "Principles and Illustrations of Morbid Anatomy," by the writer, figs. 65 to 74.

Valves of the left side, *alone*,	92·6	or $\frac{9}{10}$ths.
" " right side, *alone*,	2·1	or $\frac{1}{47}$th.
" both sides,	6·31	or $\frac{1}{16}$th.

He adds, however, that he neglected to record some instances which might fairly be presumed to have occurred mainly, if not exclusively, under the first head! This would reduce his proportion below $\frac{1}{17}$th, and bring it nearer to mine, namely $\frac{1}{20}$th. I suspect, however, that it will eventually prove to be lower still." (Hope, *on Diseases of the Heart:* Dr. Pennock's edit. p. 343: Philad. 1842.)]

It is remarkable that in all our own cases, and nearly all those of the authors quoted, (with the exception of Dr. Latham, who is silent on this point,) the induration on the right side was merely cartilaginous. When the two sides are affected at once, it very rarely happens that the disease on the right is greater than that on the left: in general, it is much less, being comparatively slight or incipient.

The cause of the remarkable difference which the two sides of the heart exhibit in their liability to induration, has not been positively determined. Corvisart attributed it to a more decided fibrous organization of the left valves, in virtue of which they are more disposed to receive the matter that is to transform them into cartilage, or the calcareous salts that impart to them an osseous or stony hardness. Bertin has ascribed the difference to the different nature of the blood that traverses the two sides respectively, the left receiving blood of a more vital, more stimulating, more irritating quality than that by which the right cavities are moistened. Laennec does not offer a decisive opinion.

We do not pretend to decide which of these two opinions is correct, and whether both causes may not conspire to produce the effect, or whether both may not be groundless. But, in any case, we believe that disease of the left valves is promoted by the greater energy of action of the left ventricle, by which these valves are more strained. This opinion is countenanced by the facts, that ossification of the arteries, particularly those of the brain, is a remarkably frequent concomitant of hypertrophy of the left ventricle; and that this affection of the ventricle is generally attended with, or productive of, a thickened state of some of the valves.—(See Arteritis, vol. i.)

The characters of valvular induration are somewhat different according as the disease occupies the auriculo-ventricular or the arterial valves; the cause of which is to be found in the difference which naturally subsists between the valves themselves. We shall therefore describe the degenerations of the two classes of valves separately. It may be premised that there is no essential difference but in degree and frequency of occurrence, between the degenerations on the two sides of the heart; consequently, a description drawn from the left will apply to the right.

Induration of the Mitral Valve.—The appearance presented by the indurated mitral valve differs according as the disease occupies the base, the margin, or the whole of the valve.

When the whole is affected with cartilaginous degeneration, the valve is generally contracted throughout, and what is lost in space appears, as it were, expended in thickening the free border; for this is converted either into a ring, an oval-shaped collar, or a transverse slit like a button-hole. The size of the aperture is various. We have seen it of all sizes from an inch to a quarter of an inch in its longest diameter.* The thickness of the border likewise varies. We have seen it equal a writing-quill. When the valve is thus contracted, it generally projects more or less, in a funnel shape, into the cavity of the ventricle. In one case we found it project so far that the columnæ carneæ were inserted immediately into the ring, the chordæ tendineæ having disappeared. The surface of the induration is smooth, polished, and translucent, until the disease throws out osseous or other excrescences, which, interfering with the integrity of the investing membrane, render it corrugated, rugged, and opaque. Before ossification takes place, the induration described sometimes presents a truly cartilaginous hardness, and sometimes the consistence of fibro-cartilage, or only that of tendon. When divided, the aspect of the section varies according as the disease is cartilaginous, fibro-cartilaginous, or tendinous. In a more advanced degree, cartilaginous induration is transformed into imperfect bone. It seldom happens, however, that more than a very small proportion of the cartilaginous mass is ossified, and the change takes place sometimes at its surface, and sometimes deep in its substance. The bone produced does not exhibit the fibrous structure and peculiar arrangement of natural bone; though, as it contains a large proportion of cartilage, it may be presumed to possess more or less vascularity and vitality.

There is another species of osseous induration of the valves, which is essentially different from the above, inasmuch as it consists of calcareous matter in great predominance, and, like vesical calculi, has no vitality. It presents itself under the form of small, polished, and semi-transparent scales; or of minute, yellowish, opaque granules, the agglomeration of which forms concretions of various dimensions, from a mere point to the size of a horse-bean. The deposition commences underneath the lining membrane, and generally in a small patch of indurated, cheese-like matter, usually called *steatoma*, the surrounding parts being healthy. The scales lie flat and superficial under the membrane, while the granules penetrate more or less deeply into the subjacent tissues. When either the scales or the granules enlarge, and their surfaces become rugged or acuminated, they cause absorption of the internal membrane, and come in immediate contact with the blood.

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* Cases illustrating nearly all the diseases of the valves hereafter described, are detailed in "A Treatise on the Diseases of the Heart," by the writer of this article.

Some authors believe that ossifications of this latter description are *natural* to old people, because they occur in the majority of those who have attained the age of sixty. Whatever be the character of the ossification, whether it be mixed with cartilage or purely calcareous, to us it appears to be always a morbid production. The circumstance of its occurring in the majority of persons above the age of sixty does not militate against this view; for, as the elasticity of the arterial, as of all the other tissues, is diminished by age, the valves of the heart and the coats of the arteries are, in the aged, less capable of resisting the distending force of the blood, and are therefore more liable to disease. Nor does the circumstance of the ossification being more calcareous and less cartilaginous in the old than in the young, prove that in the former it is a *natural* change. It confirms, indeed, what is proved by every part of the bony tissue; viz. that in age the ossific tendency is greater; but it does not, for this reason, follow that the tendency is natural when it displays itself in unnatural situations, as in the heart and arteries.

Sometimes the membranous portion and free margin of the valve are healthy, while the fibrous zone at the base is cartilaginous, or beset with small calcareous incrustations, or, as sometimes happens, its whole substance is converted into a thick ring of bone. By these depositions at the base of the valve, the orifice is more or less contracted, while the valve itself may remain capable of closing. In many cases, again, the base and middle are sound, and the free margin alone is diseased, its conical processes forming adhesions with each other and contracting the circumference of the valve to such an extent as almost completely to close the orifice. It is not uncommon to find the margin studded with small cartilaginous nodules, or roundish calcareous granules, which prevent the accurate adaptation of the edges to each other, and allow regurgitation during the ventricular contraction. Sometimes the cordæ tendineæ are contracted, so as to prevent the valves from completely closing during the ventricular systole. This is a lesion perpetually overlooked by those whose attention has never been directed to it: yet, being attended with regurgitation, it constitutes one of the worst species of disease of the valves. Much confusion may have been occasioned by such an oversight, the anatomist pronouncing that the organ was sound, while the most marked symptoms had previously indicated its disease. The same formidable effects ensue, and the same remarks are applicable, when, in consequence of dilatation of the orifice, the valves are not large enough to close it; a condition of parts not unfrequent in cases of great dilatation of the heart. Sometimes, the only diseased appearance that the valve presents, consists in brittle scales or patches of pure phosphate of lime between the two component layers of the membranous portion, which they occasionally rupture, and thus come in immediate contact with the blood.

Induration of the Aortic Valves.—Induration of the aortic valves, like that of the mitral, is more frequent and extensive at the base and free border than in the intermediate space. At the border it originates more especially in the corpora sesamoidea, and these bodies are sometimes enlarged by cartilage to the size of peas. We have seen the margin contracted by the fibro-cartilage into a ring a quarter of an inch in diameter. The valves are sometimes thickened, nodulated, and corrugated by an opaque yellow degeneration, consisting of a mixture of cartilaginous and steatomatous matter. We have seen the angles of the valves detached from their bases and partially wasted away by this degeneration; so that, adhering by their centres only, they hung loose into the artery and were destitute of fulcra by which to oppose the retrograde pressure of the aortic blood. In another instance, the same disease had undermined and detached the bases of all the valves throughout nearly their whole length; and, under one of them, it had led to the formation of a canal, as wide as the little finger, beneath the lining membrane of the heart, leading to an aneurism in the muscular substance of the septum between the left auricle and ventricle.

Such are the cartilaginous and steatomatous degenerations of the aortic valves. The osseous, of which we have next to speak, are perhaps even more frequent in the aortic, than in the mitral valve. The ossification may be either pure, or combined with cartilage. In one case under our observation, an irregular, scabrous, and denuded concretion, the size of a pea, occupied the edge of one of the valves and projected into the cavity of the artery. In another case, a similar mass, of a conical shape, sprang from the base between two of the valves, and presented its apex towards the centre of the vessel. Smaller concretions of this description and in this position, are common. M. Bertin saw an ossification of one of the aortic valves which had attained the size of a pigeon's egg. (Obs. liii.) In one of our cases, already alluded to, the fibrous zone encircling the base of the aortic orifice was converted into a ring of bone as thick as a quill.

When the ossification is confined to the margin and base, while the middle portion is still healthy over a certain extent, the valve, if its thickening is not very considerable, may still rise and fall, and not offer any marked obstacle to the circulation. But when the ossification pervades the middle portion of the valves, they shrink, become soldered together, or curl up upon themselves, in the direction either of their concavity or their convexity, so as to present a rude representation of certain sea-shells. In this state, they may become immovable. If curled forwards, they remain applied along the walls of the aorta, and oppose no other impediment to the course of the blood than what results from their thickness. If curled backwards, they remain fixed in the fallen or shut position, and considerably contract the orifice. Not unfrequently, one of the three valves is curled in an opposite direction to the other two. Corvisart has seen all three ossified in the closed position, and they would only have left an extremely narrow cleft for the passage of the blood, had not one retained sufficient mobility at its base to perform a movement which augmented, by a line or two, the width of the cleft.

INDURATION OF THE VALVES ON THE RIGHT SIDE OF THE HEART.—Induration of the right or venous valves is, as already stated, almost always simply cartilaginous or fibro-cartilaginous, and is comparatively rare, not existing in perhaps more than about one case in five of disease in the left valves. It seldom presents itself without being accompanied by disease of the left valves also, and it is, in general, less advanced than the latter. The tricuspid is more frequently affected than the pulmonic valves. We never happen to have seen the latter diseased, but we have once found them incapable of closing the orifice in consequence of dilatation of the artery, and we have seen the orifice contracted to the diameter of a quill, an inch below the valves. M. Bertin has seen the valves themselves contracted into a circular aperture only two lines and a half in diameter. As already stated, disease of the right valves, whether cartilaginous or osseous, differs from that of the left only in frequency and extent, its characters being essentially the same.

Exciting causes of valvular induration.—These are, first, such as overstrain the valves by increasing the force of the circulation; namely, violent efforts, hypertrophy, increased action of the heart from nervous, febrile, or inflammatory excitement: secondly, inflammation of the internal membrane of the heart, resulting from carditis, pericarditis—especially rheumatic, from fever or from any other cause. It would be an unnecessary repetition to dwell on this subject, as we have treated of it in the article ARTERITIS.

WARTY VEGETATIONS OF THE VALVES.—These excrescences bear a close resemblance to venereal warty vegetations on the external organs of generation. Their form is in general irregularly spherical, oval, or cylindrical: their size varies between that of a small pin's head and a large pea, but when isolated they are occasionally as large as a horse-bean. Their surface is polished, but often lobulated like a raspberry: they are found either isolated, in clusters, or in closely agglomerated patches like the surface of a cauliflower. Their number is various; sometimes there are only one or two, and sometimes they pervade the whole of the valves, the tendinous cords, and a great portion of the auricle. Their colour, occasionally of a greyish or yellowish white, is more commonly heightened, universally or in parts, with pink or red of greater or less depth. Their texture is fleshy and slightly translucent, like the exuberant granulations of an ulcer. Their consistence is variable; in general they are soft and humid, as if only recently and imperfectly organized: and they can then be easily scraped off with the handle of the scalpel; but sometimes they are firm, and cannot be detached without tearing with the nail or cutting with the edge of the scalpel. Firm vegetations are generally larger and more truly warty than soft.

The internal membrane of the part from which vegetations spring, is almost invariably more or less diseased. It is thickened, steatomatous, or cartilaginous, ossified, ulcerated, or ruptured. When vegetations grow from a diseased but *unbroken* surface, they may be numerous and occur in several parts at once; but when they grow merely from a ruptured or ulcerated edge, they are few in number, often not exceeding one or two, are generally confined to that edge exclusively, and attain a larger size than any others. We have seen them exceed a horse-bean, and with a neck two, three, or four lines long. It cannot be doubted that their origin is connected with the broken state of the membrane.

The base and the free margin of the valves appear to be parts peculiarly favourable to the growth of warty vegetations. Along these, but especially the latter, they are often arranged in a single row. They occur on both sides of the heart, but less frequently on the right. The aortic valves are those most subject to them. They are more rare in the auricles than on the valves, especially in the right auricle. We have seen one-third of the left auricle completely covered with them. When situated at the base, or the free margin of a valve, they contract its aperture according to their size and number.

Laennec thought it "undubitable that vegetations were nothing more than small polypous or fibrinous concretions, which, being formed on the sides of the valves or auricles, become organized by a process analogous to that which converts albuminous false membranes into adventitious membranes or cellular tissue." This opinion is unsatisfactory; for as polypi are most common in the right cavities of the heart, vegetations ought to be so likewise,—the reverse of which is the fact. The valves, moreover, being perpetually in motion, would be the last parts to which albuminous concretions would adhere, as a stagnant state of the blood is most favourable to their formation; yet the valves are the parts most subject to them. It is amidst the intricacies of the columnæ carneæ, where the blood is more stagnant than elsewhere, that we most commonly find *real* albuminous concretions of small size. Finally, if vegetations were merely fibrinous concretions, instead of being rare, they ought to be frequent; for, as the circumstances which, on this view, lead to their formation, are common to all persons labouring under an obstructed circulation, all, or to say the least, many, should be affected with them.

Kreysig attributes their formation to inflammation. MM. Bertin and Bouillaud have espoused the same opinion, resting on the fact that vegetations bear a close analogy to the albuminous granulations occasionally found on serous membranes affected with chronic inflammation. The small and soft vegetations certainly do bear this analogy—a fact of which we have satisfied ourselves by comparing the two as occurring in the same subject; but the like cannot, in the least degree, be said of the large and more properly wart-like vegetations; whence it is to be inferred that inflammation *alone* is not their cause. We are disposed to think that it is inflammation modified by some other morbid action dependent either on the constitution, or on previous structural lesions of the parts affected.

The resemblance which the firmer valvular vegetations bear to venereal warts, led Corvisart to think that they might have the same venereal origin. This opinion, however, is not tenable, as extensive observation in venereal hospitals has proved that vegetations of the heart are not more common in persons affected with this disease than in others; and it is certain that they have occurred in some who had never been in the least degree tainted with the disease.

Pathological effects of disease of the Valves, and mode of their production. — Diseases of the valves, whatever be their nature, whether osseous, cartilaginous, or warty, have for their common effect to obstruct the orifices of the heart; and this they do, either by contracting the apertures, or by encumbering the valves in such a manner as to prevent them from opening and closing with suitable accuracy and facility. A mechanical obstacle is thus presented to the circulation, and from the obstruction and embarrassment which it occasions, are derived the symptoms of valvular disease.

The general symptoms, however, when of an aggravated nature, are seldom dependent on the valvular obstruction exclusively; they are partly attributable to a co-existent disease of the muscular apparatus of the heart. For, so long as the organ remains free from dilatation, hypertrophy, or softening, the valvular disease, according to our observation, is not in general productive of great inconvenience.

This opinion is founded on the following grounds. We have seen individuals who were affected in an eminent degree with disease of the valves or of the aorta, maintain for years a very tolerable state of health so long as there was no hypertrophy or dilatation of the heart; but, in proportion as these supervened, the symptoms of valvular obstruction became more and more developed, and eventually assumed their most aggravated form.

We have reason to believe that, in these cases, the symptoms were attributable in a great measure to the hypertrophy or dilatation; because we have seen a greater valvular contraction produce less severe symptoms when the hypertrophy or dilatation was less considerable. It might be supposed that a great degree of contraction would of itself suffice to produce the symptoms of an obstructed circulation in their most aggravated form. This is highly probable, but it does not easily admit of demonstrative proof, as a great degree of contraction is perhaps never found, on dissection, without hypertrophy or dilatation. We therefore infer that these affections ensue as consequences of valvular contraction, and we believe, for the reasons above assigned, that they play an important part in the production of the symptoms.

It is of immense practical importance to keep in view the facts stated, namely, that valvular contraction does not produce formidable symptoms until it has given rise to hypertrophy or dilatation; and that it invariably leads to these affections unless the circulation be kept tranquil. We thus know that the most efficacious treatment of valvular disease consists in employing such prophylactic measures as are calculated to prevent the supervention of hypertrophy or dilatation, and in employing them with the same uncompromising strictness before those affections have appeared, as if they actually existed.

It remains to be explained how dilatation and hypertrophy aggravate the symptoms of valvular obstruction. We have elsewhere shown (See Dilatation of the Heart) that dilatation of the heart, by enfeebling the contractile power of the organ, constitutes as truly an impediment to the circulation as a more direct mechanical obstacle. When, therefore, dilatation exists in addition to such mechanical obstacle, it is clear that the symptoms, having a twofold cause, must be doubly severe.

Hypertrophy aggravates the symptoms of valvular obstruction, because the heart, being morbidly irritable, struggles against the obstacle, and falls into fits of palpitation; and as, during these, a greater quantity of blood than natural has to be transmitted through the contracted aperture, the circulation is performed with increased difficulty.

It is in consequence of these reciprocal reactions of the valvular and the muscular apparatus on each other, that cases thus complicated are more severe than any others.

From what has been said here and in the article Dilatation, the reader will judge how totally some authors have been wrong in referring the obstruction of the circulation to the valvular contraction exclusively, without allowing that the enlargement of the heart contributed in any degree to the effect. Such a doctrine is not only erroneous, but dangerous, as it leads to pernicious practice. For, imagining the valvular contraction to be the only formidable part of the complaint, to it alone those authors direct their attention; and, acting on the inaccurate presumption that the contraction is in *all* cases caused by, and accompanied with, inflammation, they attack it with bloodletting, general and local, abstinence, digitalis, &c.; means which cannot remove valvular contraction when once formed, (as must always be the case before the symptoms can exist,) and which are, therefore, a useless expenditure of the patient's strength. It is true, indeed, that measures calculated to diminish the force of the circulation are useful in obviating the supervention of hypertrophy or dilatation — the paramount source of danger in these cases; — but measures employed for this purpose, and which must be continued for an indefinite length of time, cannot be practised with the same activity as for the purpose of curing an inflammation. We would not be understood by this to mean that valvular disease is *never* accompanied by inflammation, and that, when so accompanied, it should not be treated by antiphlogistic measures: but we mean that they should not be employed unless there is reasonable evidence of inflammation.

Diagnosis. — I. *General Signs.* — Whether the disease of the valves be cartilaginous, osseous, or consist of vegetations, the general symptoms are the same, if the degree of contraction be equal. Keeping in view the principles developed in the preceding section, we should assign to disease of the valves, as its general symptoms, 1. a greatly aggravated form of the same which have already been assigned to dilatation of the ventricles; 2. certain symptoms of a peculiar and distinctive character.

1. The general symptoms are cough, copious watery expectoration, dyspnœa, orthopnœa, frightful dreams and starting from sleep, œdema of the lungs, pulmonary apoplexy, passive hemoptysis,

(i. e. sputa stained with dark or grumous blood,) turgescence of the jugular veins, lividity of the face, anasarca, injection of almost all the mucous membranes, passive hemorrhages, especially of the mucous membranes, engorgement of the liver, spleen, &c., and congestion of the brain, with symptoms of oppression sometimes amounting to apoplexy.

The pulmonary symptoms result from engorgement of the pulmonary vessels, when the left valves are obstructed: and, when the obstruction is in the right valves, they result partly from engorgement of the bronchial veins, and partly from the quantity of blood transmitted into the lungs not being adequate to their demand — an unnatural state, which gives rise to dyspnœa, as will be presently shown. In the latter case hemoptysis is more rare. The symptoms affecting the system in general result from retardation of the blood in the venous system.

2. The peculiar and distinctive symptoms of valvular disease are the following.

a. When the disease is combined with hypertrophy or dilatation, as is commonly the case, the symptoms are more severe than those of hypertrophy or of dilatation alone, the paroxysms of palpitation and dyspnœa in particular, being more violent, more obstinate, and more easily excited.

b. The action of the heart is irregular. This, it is true, may sometimes be the case in hypertrophy and in dilatation, but here it is an accidental, not an essential character. The pulse, which we may regard as the representative of the heart's action, may, in valvular disease, be small, weak, intermittent, irregular, and unequal; and it may even be small and weak while the heart is giving a violent impulse — a contrast which affords one of the strongest presumptions of valvular disease. The least degree of derangement is intermission; for in this the rhythm of the heart's action is not subverted, there being either a total omission of one or more ventricular contractions, or one, two, or three feeble contractions audible by the stethoscope, but scarcely, if at all, sensible in the pulse; yet the next full contraction recurs at the correct interval; that is, supposing the pulse to beat crotchets, the contraction in question recurs at the crotchet. Irregularity is an ulterior degree of derangement, for here the rhythm *is* subverted, the beats recurring at irregular intervals. It is generally accompanied with inequality, some beats, both of the heart and pulse, being strong, and others weak. The degree to which these characters of the pulse exist, depends on the situation of the valve contracted and the extent of its contraction. We shall, therefore, point out more particularly which of the characters are produced by given states of certain valves; for, this being known, we have a valuable means of ascertaining the situation and extent of the valvular disease.

The characters of the pulse just described, are most marked in contraction of the mitral valve, and in states of the valve admitting of regurgitation. If either the contraction or the regurgitation be great, all the worst characters of the pulse are invariably present: for, in the case of contraction, the left ventricle, not being freely supplied with blood, is not stimulated to contract at the natural intervals and with suitable energy; and, in the case of regurgitation, the ventricle, not being able to disgorge itself through the aorta, for want of the accustomed fulcrum in the mitral valve, labours under a state of more or less constant repletion, and therefore contracts languidly and irregularly whenever the stimulus of fulness happens to be greater than usual, or its own exhausted irritability allows it to answer the call. In such cases, the pulse is always very soft and feeble — for the obvious reason that the force of the ventricular contraction is determined in a retrograde, as well as in a forward direction.

A slight contraction of the mitral valve (when, for instance, the diameter of the aperture is not diminished more than a quarter of an inch) does not unnecessarily produce an unsteady pulse, as it still allows of an adequate supply of blood to the ventricle. When, however, the circulation is hurried, the pulse generally becomes unsteady. Slight regurgitation, likewise, may not materially affect the pulse.

Contraction of the aortic valves must be very great to render the pulse small, weak, intermittent, and irregular. We have never seen it possess these characters in any marked degree unless the valves were either soldered together by cartilaginous degeneration, or more or less fixed by ossification in the closed position, so that the aperture was only a limited chink.

An induration of the size of an ordinary pea, has little effect on the fulness, firmness, and regularity of the pulse, and slighter degrees of contraction appear to have no effect on it whatever.

The pulse is less irregular when the valvular contraction is on the right side, than when it is on the left; the action of the heart appearing to be less under the influence of the right ventricle than of the left, — in consequence, perhaps, of the muscular apparatus of the latter being stronger and more irritable. The pulse is not so small and weak from a contraction on the right side as on the left, and contraction of the tricuspid valve causes more irregularity than contraction of the valves of the pulmonary artery.

c. Pain in the region of the heart is another symptom of disease of the valves. It is true that palpitation may occasion pain though there be no disease of the valves, and we have frequently met with it from this cause in hypertrophy and dilatation. It is likewise true that palpitation may occasion pain though there be no disease of the heart whatever; we have often found it in hysterical females, and in nervous men. But it is when the valves, the coronary arteries, or the commencement of the aorta, are indurated and inelastic, that pain occurs most frequently and with the greatest severity. Sometimes it is little more than an indescribable sense of obstruction or oppression in the præcordial region; but, in other cases, it is an intense lancinating or tearing pain, felt across the præcordia or scrobiculus cordis, (where it might be mistaken for inflammation of the stomach,) and occasionally extending, with a sense of numbness, down the left arm to the elbow and sometimes to the fingers. Pain of this description has acquired the name of *angina pectoris.* (See Angina Pectoris.) We believe this pain to be, in general, occasioned by the inelasticity of the ossified or otherwise indurated parts, which will not stretch equally with the other portions of the heart, when the organ is labouring under palpitation or disgorgement.

When inflammation of the interior of the heart exists, either alone or accompanying disease of the valves, it also occasions pain; but those authors have unquestionably been wrong, who have considered inflammation to be the sole cause of pain, and have therefore assumed this symptom as a proof of the inflammatory nature of disease of the valves.

The exact time and manner of the fatal termination in valvular disease, as in every other organic affection of the heart, is very uncertain. Sometimes the patient is reduced gradually to an extreme degree of emaciation and debility, and dissolution is duly announced by the usual premonitory symptoms. Sometimes he expires suddenly, after any trifling exertion or emotion, though the malady has made comparatively little inroad on the constitution. Not unfrequently pressure on the brain, whether from serous effusion or venous congestion, is the immediate cause of death, and in this case coma gradually supervenes from three to four days or a week previous to the fatal event. In one case of serous effusion under our care, the patient suddenly uttered a shriek and fell at once into perfect coma. The same occurred in another case, in which there was only a small effusion of blood.

Hence, the prognosis must always be general as to time, and, if the case be considerably advanced, it must be guarded with a clause, that the patient is liable to die suddenly and unexpectedly.

II. *Physical Signs.* — Before the discovery of auscultation it was extremely difficult, and in many cases utterly impossible to detect disease of the valves. Corvisart had the merit of discovering, as its signs, certain states of the pulse and a "peculiar vibration difficult to describe, sensible to the hand applied to the præcordial region:" — in other words, the cat's *purring tremor* (*frémissement catairé*) of Laennec. But, as these signs may occur under other circumstances, they do not denote disease of the valves in particular, and are totally insufficient to indicate which is the valve affected. The accession of auscultation to the other means of diagnosis has rendered it possible to distinguish valvular disease with almost complete certainty: a certainty, it may be remarked, much greater than was supposed by the illustrious author of auscultation himself; for he did not give their full value to preternatural murmurs as signs of disease of the valves, in consequence of supposing that similar murmurs were produced by a spasmodic contraction of the muscular fibre of the heart and even of the arteries. We have elsewhere (in a "Treatise on the Diseases of the Heart," p. 47 and 56) attempted to show that it is not the muscular contraction, but the movements of the blood, which are in all circumstances the cause of these preternatural murmurs. Laennec laboured under another disadvantage: he attributed the *second* sound of the heart to the auricular contraction; whereas, according to the experiments of the writer, it is referable to the ventricular diastole. (Ibid. p. 26 and 36.) The substitution of this view of the heart's action for hat of Laennec, fortunately does not falsify any of his physical signs, except one, viz. that "loudness of the second sound indicates dilatation of the auricles;" it does not, to adduce a single instance, invalidate the fact that murmur of the second sound indicates disease of the auriculo-ventricular valves; but it affords a rational explanation of all the phenomena noticed by Laennec, and renders various others available as signs, which to him were inexplicable and therefore useless.

Bellows—filing—rasping—sawing—and musical or whistling murmurs.—When a valve is contracted, the blood, in passing through it, is thrown into more than ordinary commotion and occasions a morbid murmur. This murmur has a *soft* character, like that of *bellows*, when the contraction has a smooth surface which does not greatly break the stream of blood, as when the morbid deposition consists of cartilage, fibro-cartilage, or vegetations. But the murmur is rougher or more grating, like that of a *file* or *rasp*, when the disposition has a rugged, hard surface, as when it is osseous. Murmurs are more *hollow* when they are deep-seated, as for instance, in the auriculo-ventricular orifices; and more *hissing* or *whizzing* when they are superficial, as in the aortic orifice, more especially in the pulmonary orifice, and the ascending aorta. The hollowness of the sound is referable to its remoteness and its reverberation through the chest. The *sawing* murmur is almost identical with the filing or rasping; it is only less grating and on a higher key.

The *musical bellows-murmur* is a perfect note like whistling or cooing. In the case of a patient who applied to us for "a noise in the chest," we heard it at the distance of two feet. In a case precisely similar, which occurred to Dr. Elliotson, there was a very large and long vegetation in the mitral valve. We imagine that this sound is to be accounted for on the same principle that air emitted from the lips in one way produces merely a blowing sound: in another, produces a whistle. We have repeatedly heard the sound in various degrees.

Purring tremor is another sign of disease of the valves. It arises from the vibrations into which the blood is thrown during its passage through an obstructed orifice, and is felt in the præcordial region and sometimes in the arteries. We have never felt it in the pulse when the patient was calm, unless hypertrophy was conjoined with obstruction of the aortic orifice or with roughness and dilatation of the ascending aorta: but we have felt it during palpitation, though there was neither hypertrophy nor disease of the heart or aorta: whence we infer that it requires for its production in the pulse an increased force or velocity of the circulation, but not necessarily a valvular or aortic obstruction. In the præcordial region it is more easily produced, and we have found it exist here when there was neither hypertrophy nor palpitation; but it was in cases in which the valvular disease was considerable, and the power of the heart certainly not deficient. It may be occasioned by disease, not only of the semilunar, but also of the mitral and tricuspid valves, and in the latter cases it may accompany either the first or the second sound. When accompanying the first, it proceeds from regurgitation through the valve; and when accompanying the second, it results from the impeded passage of the blood from the auricle into the ventricle during the ventricular diastole. It rarely accompanies the second sound; because, as we conceive, the diastolic current is seldom strong enough to produce it. When from disease of the mitral valve, it is not perceptible in the pulse.

As purring tremor has the same origin as bellows and other murmurs, it often accompanies them; though, as it requires a greater degree of disease for its production, this is not always the case.

Having now given an account of the various murmurs and of purring tremor as signs of disease of the heart *in general*, we proceed to show in what manner they constitute signs of disease of each of the valves in particular; and it may be premised that, as the sounds of one side of the heart are audible on the other, the sound of the healthy side will partake more or less of the murmur of the diseased side, and *vice versâ*.

Signs of Disease of the Aortic Valves.—One of the murmurs above described is heard during the ventricular contraction about the middle of the sternum, and is louder here than elsewhere. It is more or less hissing or whizzing, from being superficial, and it accordingly conveys the idea of being near to the ear. When a murmur of this kind is louder along the tract of the ascending aorta than opposite to the valves, and is, at the same time, peculiarly superficial and hissing, it proceeds from disease of the aorta itself. As a murmur from this source often extends to the situation of the valves, it might easily lead to the supposition that they also were diseased, and it is sometimes very difficult to ascertain positively that they are not. A murmur may accompany the second sound when there is regurgitation through the aortic valves, and its source may be known by its being louder and more superficial opposite to those valves than elsewhere. We have never found it strong, and we doubt whether it can be so; as the instantaneous manner in which the ventricle is refilled by its diastole, must prevent the regurgitation from being considerable.

[The writer has been induced to infer, that where a rough sound accompanies the second, it is not owing always to a morbid condition of the semilunar valves, but to the refluent blood passing over the lining membrane of the aorta roughened by ossific deposits. (See an interesting case in *Med. Examiner* for May 18, 1844.)]

Purring tremor generally requires for its production, by disease of the aortic valves, a considerable degree of contraction of a rugged hard nature, with hypertrophy; especially to produce it in the pulse.

Signs of Disease of the Mitral Valve.—When this valve is contracted, the second sound loses, on the left side, its short, flat, and clear character, and becomes a more or less prolonged bellows-murmur. When the valve is permanently patescent, admitting of regurgitation, the first sound likewise is attended with a murmur. These murmurs are louder opposite to the mitral valve, (viz. at the left margin of the sternum, between the third and fourth ribs, i. e. about three or four inches above the point where the apex of the heart beats,) than elsewhere. They are also more hollow than murmurs of the aortic valves. By these two circumstances the murmur of the first sound may be known to proceed from the mitral, and not from the aortic valves: that of the second proceeds, either from the mitral, or, what is much more rare, from regurgitation through the aortic valves. The means of ascertaining when the latter is its source, have been explained above. With respect to the mitral, the murmur of the second sound is diminished when the contraction of the orifice is extreme; when, for instance, the aperture does not exceed two or three lines in diameter; for then the quantity of blood transmitted is not sufficient to create a loud murmur. For the same reason the murmur is diminished when the auricle is obstructed by a polypus; but the diminution under these circumstances is of little importance to the diagnosis; as extreme contraction of the mitral, and polypi in the auricle, can be detected by the characters of the pulse, and the assemblage of other signs.

Purring tremor may be produced by disease of the mitral valve, especially if the ventricle be hypertrophous and dilated, by which the currents through the valve are rendered stronger.

Signs of Disease of the Aortic and Mitral Valve conjointly.—The murmurs above described as characteristic of each, exist simultaneously in the situation of each valve. If the murmurs of the first sound be of a different *species* in the two situations—if, for instance, the murmur of the aortic valves be of the bellows kind, and that of the mitral resemble filing or rasping, it is still easier to determine that both valves are diseased.

Signs of Regurgitation through the Mitral Valve.—These signs are, a murmur with the first sound, louder in the situation of this valve than of the aortic; and a weak pulse, even though the impulse of the heart be violent. It is generally unsteady also.

Signs of Disease of the Pulmonic Valves.—The signs are the same as those of disease of the aortic valves, with this difference, that the murmur seems *close* to the ear, and is equally hissing as in disease of the ascending aorta. Disease of the pulmonic valves is so rare that it ought never to be suspected unless the signs described are extremely well marked, or unless there be patescence of the foramen ovale, or some other preternatural communication between the two sides of the heart—states, which experience has proved to be in general accompanied with contraction of the pulmonic orifice.

Signs of Disease of the Tricuspid Valve.—They are the same as those of disease of the mitral, except that the murmurs are loudest opposite to the valve: viz. at the middle part of the sternum, opposite to the inter-space between the third and fourth ribs and a little to the right of the mesial line. As this valve is very seldom affected, the practitioner must be very cautious in pronouncing it diseased, especially as the pulse does not afford the same evidence as in contraction of the mitral orifice.

Such are the signs which, together with the general signs, are, according to our experience, the best for the detection of disease of the valves. For several years they have never deceived us as to the general fact whether there was, or was not, valvular obstruction; and they have seldom failed to indicate, with perhaps more than necessary precision, the situation and nature of the affection.

To make the signs available, however, it is necessary to attend to several circumstances which might lead to the deception. Bellows-murmur sometimes exists in the heart, though there be no disease of the valves; namely, in nervous persons, in cases of reaction from excessive loss of blood, of pericarditis and adhesion of the pericardium, and of hypertrophy with dilatation. Murmur from these causes may easily be distinguished from that of valvular disease by the following criteria. When from nervous excitement, very common in hysterical females, it may be known by its being intermittent, ceasing when the nervous exacerbation subsides and the action of the heart becomes calm. When from reaction, it subsides with the cessation of that phenomenon. When from pericarditis or adhesion of the pericardium, it may be known by the presence of signs of those affections. When from hypertrophy with dilatation, it may be known by its diminishing or ceasing when the action of the heart is calmed, as by repose, venesection, abstinence, &c., &c.

Contrasted with the above, the distinctive characters of valvular murmur are, that it is not universal over the heart, but confined in a great measure to the part corresponding to the valve affected; that it persists without intermission for an indefinite length of time, even though the heart be kept in a state of perfect calm; and that it is often of the filing, rasping, or sawing kind; whereas murmurs from other causes have almost always the softness of the bellows sound.

[Still, the writer is prepared to say, from his experience, that the diagnosis of valvular disease is at times extremely obscure. Dr. Graves, indeed, expresses the opinion, that the functional derangements produced by disease of any particular part of the heart are seldom sufficiently characteristic to enable us to make out whether the disease be situate in the auriculo-ventricular or in the semilunar valves; and he frankly owns that it has frequently occurred to him to find that all the symptoms supposed to be indicative of disease of the right side of the heart have been occasioned by disease of the left; and conversely. Some observers place the greatest reliance on the physical signs as means of diagnosis, whilst others regard them as altogether uncertain. It has been affirmed by distinguished observers, (Messrs. Graves and Stokes, cited in *American Med. Intelligencer*, Nov. 1, 1838,) *first*, that the physical signs of valvular disease are not fully established; *secondly*, that, taken alone, they are in no case sufficient for diagnosis; *thirdly*, that even in organic disease, the nature and situation of murmurs may vary in the course of a few days; and, *fourthly*, that organic disease of the valves may exist to a very great degree without any murmur whatsoever.]

Cardiac Asthma.—Among the diseases of the heart may be justly reckoned one of the forms of the malady termed in common language *asthma*. The group of symptoms ordinarily ranged under this name, have been too much regarded as independent of disease of the heart. It becomes therefore necessary to notice the subject, formally, in this place, not only for the purpose of showing the magnitude of the error, but of making the reader acquainted with all the habitudes and aspects of a complaint, which is perhaps the most distressing in the whole catalogue of human maladies.

Corvisart has remarked that the ancients confounded under the name of *asthma*, and erroneously regarded as purely nervous affections, dyspnœas resulting from various organic diseases, particularly those of the heart and great vessels.

That they were wrong in regarding the latter as purely nervous affections, and especially in confounding them with those forms of dyspnœa that were such, is unquestionable; but they were, in our opinion, correct in embracing under the general term *asthma*, cardiac dyspnœa of a certain intensity, and exhibiting certain characters hereafter to be described; for it is established by the concurrent testimony of all moderns conversant with diseases of the heart, that these diseases, no less than those of the lungs themselves, may constitute the organic causes of asthma.

A theoretical consideration of the subject leads, in our opinion, to the same conclusion; for, on tracing asthma back to its source, we shall find that, whatever be its proximate cause in different cases, it depends, in all, on the same ultimate cause; namely, inadequate oxygenation of the blood, and the *sensation* of want of breath resulting from it. In order to render this apparent, it will be necessary briefly to analyze the several varieties of asthma, and then compare them with each other.

Inadequate oxygenation of the blood results in all ordinary cases from one or more of three proximate causes: viz.

1. Insufficient admission of air into the bronchial tubes and air-vesicles.

2. Insufficient exposure of the blood to the air admitted, in consequence of a less pervious state of the mucous membrane than natural.

3. Insufficient admission of blood into the lungs.

It will be found that to one or more of these causes, all the varieties of dyspnœa and asthma are referable.

All the varieties of asthma—to give an approximative statement probably very near the truth—are comprised under the following heads:—

1. From chronic dry catarrh, and the emphysema resulting from it.

2. From pituitary catarrh, (humoral asthma,) whether acute or chronic, but more especially the latter, and the pulmonary œdema resulting from it.

3. From mucous catarrh, especially chronic.

4. From organic disease of the heart.

5. From purely spasmodic constriction of the bronchial tubes.

We do not include amongst the varieties, one from the compression of the lungs by hydrothorax, by tumours, by imperfect descent of the diaphragm, &c., because these rarely occasion what can strictly be called asthma.

1. *Chronic Dry Catarrh* is attended with intumescence of the internal membrane of the bronchial tubes. The intumescence exists principally in the smaller tubes, which are sometimes completely obstructed by it; but it is also found in the larger. Andral has seen the bronchial trunk of a lung so contracted by this intumescence, that the air could scarcely enter; and in another case,

the third and fourth bronchial divisions were contracted by the same cause. (Clinique Méd. seconde partie, obs. ii. et iii.) Further, the tubes are more or less obstructed by an exceedingly viscous mucus, often as dense as the vitreous humour of the eye; and when the dry catarrh is universal or even very extensive, it is almost invariably productive of emphysema.

2. *Pituitary Catarrh* is attended with moderate intumescence, slight softening, and partial redness of the pulmonary mucous membrane—a state intermediate between sanguineous and serous congestion, but partaking more of the latter. The quantity of phlegm expectorated, always considerable, is sometimes enormous, amounting to from four to six pints of thin glairy fluid in twenty-four hours.

The air-passages being obstructed partly by the intumescence of their mucous membrane and partly by this fluid, it necessarily follows that there is an insufficient admission of air into the lungs.

3. *Mucous Catarrh* is accompanied with more or less tumefaction of the bronchial membrane and obstruction of the calibre of the tubes. The expectoration, though less copious, and different in quality from that of pituitary catarrh, is, notwithstanding, frequently abundant, amounting to one or two pints or more in the day. Consequently, there is an insufficient ingress of air into the lungs.

In all the cases now mentioned, the second cause of inadequate oxygenation of the blood is, likewise, for the most part, in operation, viz. the mucous membrane being thickened, it is less pervious to air; and its mucus, the natural function of which is to expedite the combination of oxygen with the blood, probably discharges this function less perfectly, in consequence of an alteration in its chemical qualities.

4. *Disease of the Heart.*—Somotimes, from this cause, blood exists in the lungs in excess; as is the case when the right ventricle is hypertrophous, or the left side of the heart obstructed; or still more, when these two affections coexist: also when the circulation is merely accelerated, as by palpitation, running, or by slighter efforts in corpulent persons. Now, under all these circumstances, there is inadequate oxygenation of the blood: or, in other words, there is an excess of venous blood in the lungs; first, because the quantity of blood admitted exceeds its due proportion to the air in the organ; secondly, because the overloaded vessels do not transmit the fluid with natural celerity; thirdly, because the engorgement of the mucous membrane on which the blood ramifies, constricts the bronchial passages, and prevents the free ingress of air, as proved by the feebleness of the respiratory murmur. Hence the sensation of want of breath is a necessary consequence of an excess of blood in the lungs.

Sometimes blood does not enter the lungs in sufficient quantity, constituting the third cause of inadequate oxygenation; and this may arise from the weakness of the right ventricle, from an obstruction in its mouth, or from increased resistance on the part of the lungs; as, for instance, during sleep, when the respirative function is less active. Hence results the sensation of want of breath, and dyspnœa. Cases exemplifying this will shortly be adduced; meanwhile, it may be illustrated by a simple physiological experiment, viz. by making and sustaining a full *expiration*. This is attended, not only with a deficiency of air, but also with a deficient influx of blood into the lungs, as is proved by the lividity of the face which ensues, by the elevation of the fontanel in infants, by the rise of blood in a tube inserted into the jugular vein, and, lastly, by experiment; for we have demonstrated, in the treatise already referred to, that, on suspending artificial respiration in a rabbit, the heart *instantly* became gorged, of a black colour, and distended to nearly double its natural size—a phenomenon which renders it sufficiently manifest that, when the lungs are exhausted of air, the blood does not freely enter them. Now, the sensation of want of breath experienced on making a full expiration is familiar to every one, and it becomes intolerable if the expiration be long sustained.

5. *Spasmodic Constriction of the Bronchial Tubes.*—This is presumed to exist, first, because, according to the researches of Reisseissen and others, the bronchial tubes are provided with muscular fibres, and all muscles are liable to spasm; secondly, because asthma is occasionally found to occur without any organic cause (so far, at least, as our senses enable us to judge) sufficient to account for it: thirdly, because every form of organic disease above described, both of the lungs and the heart, may exist without causing dyspnœa of such intensity and of such a character as to constitute *asthma* properly so called. Thus, many have intense catarrhs, acute or chronic, and profuse expectoration, without any asthmatic dyspnœa; and we have known a patient with a contraction of the mitral orifice to the size of a small pea, and likewise with dilatation and softening of the heart and profuse expectoration, pass through a period of ten years to her grave, without ever experiencing a paroxysm of asthma, though a few steps across the room were sufficient to excite dyspnœa.

Hence we apprehend that whatever be the organic cause of asthma, it requires, for the production of the fit, the super-addition of a state of the nervous system leading to spasmodic constriction of the bronchial tubes.

Admitting that the spasmodic constriction of the bronchial tubes does take place, it is obvious that it will more or less close these tubes against the ingress of air; and this closure, again, by preventing the free expansion of the lungs, will impede the influx of blood: whence there is a double cause for the inadequate oxygenation of the blood, and, consequently, for the production and maintenance of the asthmatic paroxysm.

From all that has been said, we are now led to the resulting inquiry;—what is the essential difference between asthma from disease of the heart and that from disease of the lungs? Putting aside that variety of asthma, which, as not being attended with any *visible* organic derangement, (though it is, notwithstanding, highly probable that one exists,) may be regarded as mainly, if not wholly spasmodic, there does not appear to be any essential difference between the remaining varieties. The organic causes are diversified, but they all ultimately produce the same effect, and it is the effect which constitutes the essence of the disease. This effect is inadequate oxygenation of the blood, which causes the *sensation* of want of breath; and this, when there exists more than what may be called mere dyspnœa, occasions spasmodic constriction of the bronchial tubes, and its consequence, the asthmatic paroxysm.

We now proceed to a more particular consideration of asthma from disease of the heart: a variety which comprises, according to our observations, by far the greater proportion of the most severe and fatal cases of asthma.

Until the discovery of auscultation had in some degree dissipated the deep obscurity of the affections of this organ, the fact that they were a cause of asthma was scarcely known; and even at the present day, there are few errors more common than that of attributing asthma to other causes, when it originates solely in the heart. For instance, a theory of this description which has, within the last half century, been more widely disseminated than perhaps any other, consists in ascribing asthma to a spasmodic or convulsive contraction of the external muscles of respiration, much dependent on habit.

Now, the action of these muscles, so far from being morbid or dependent on habit, is a natural, instinctive, and salutary effort to prevent suffocation, the stimulus to which effort consists in an exaggeration of that which excites the muscles in ordinary respiration,—namely, as above explained, the *sensation* of want of breath, from inadequate oxygenation of the blood. Nothing is more common, for instance, than to see a patient with diseased heart, while sleeping tranquilly, start up and begin to respire with violence. Here it is obvious that the necessity for violent respiration preceded the act; and the necessity depends on impeded transmission of blood through the heart and lungs; for starting is invariably accompanied by palpitation, and preceded by frightful dreams or some sensation of præcordial distress, indicating an obstructed circulation. We have frequently examined the heart and lungs by auscultation immediately before the supervention of a paroxysm of dyspnœa, and have always found that the heart began either to palpitate or to act in that irregular, confused, and, as it were, struggling manner, which denotes its engorgement. We, were, therefore, enabled to tell the patient that difficulty of breathing was coming on, to which, with some astonishment, he would reply in the affirmative, being himself forewarned of the approaching accession by a feeling of anxiety and straitness in the præcordia. This fact is so universally true, that any one may satisfy himself of it by entering an hospital, and gently placing a patient with orthopnœa from disease of the heart in a rather uneasy position, when the series of phenomena described will become manifest.

Dr. Burrows communicated to us the particulars of a case, under his observation, in which the respiration was alternately violent and tranquil under the following circumstances. The patient dozed for a few minutes at a time, during which his complexion became livid, and his pulse more and more feeble, oppressed, and irregular. He then started up, and, after a few violent wheezing respirations, relapsed into the same calm doze. In this case the mitral orifice was contracted to the size of a pea. Now there can be little doubt that, as, during sleep, the sensation of want of breath is less felt, and the muscles of respiration are, consequently, less stimulated by it—in simple language, as the respiration is more feeble during sleep,[*] the lungs were not, in the present case, kept sufficiently expanded to admit of an adequate circulation of blood through them; whence ensued engorgement of the heart and venous system of the body, with insufficient arterialization of the blood in the lungs, and the sensation of a necessity for breathing resulting from it: which series of phenomena was relieved by the succeeding violent respirations.

We have frequently observed this series of phenomena in a greater or less degree. In one case, violent gasping and wheezing respiration, lasting from a few seconds to two or three minutes, occurred at intervals of four or five minutes, during which the patient dozed, even though sitting erect on a stool and undergoing a stethoscopic examination; and this series of actions continued so long as the patient remained disposed to sleep in that situation. (Med. Gazette.)

In all these cases it is manifest that the action of the muscles of respiration was consecutive to the obstruction of the circulation, and that it was not dependent on any spasm of those muscles, but simply on the necessity for breathing, which instinctively excited them to a salutary preservative effort.

Asthma from disease of the heart often imitates the characters of the other varieties; and this perhaps for a very simple reason; that the lungs are in much the same state as in those varieties. Thus, the asthma is *humid* or *humoral*, when there is permanent engorgement of the lungs, causing copious sero-mucous effusion into the air-passages, as in cases of contraction of the mitral valve. It is *dry* when the engorgement is only transitory, as in cases of pure hypertrophy. It is *continued* when there is a permanent obstruction to the circulation; and any of the varieties may be *convulsive* when the heart has sufficient power to palpitate violently. The worst cases of convulsive asthma from disease of the heart are those of hypertrophy with dilatation, together with a valvular or aortic obstruction.

We shall now examine the state of a patient labouring under severe cardiac asthma, and then take a more strictly medical view of the nature and progress of the paroxysm.

The respiration, always short, becomes hurried and laborious on the slightest exertion or mental emotion. The effort of ascending a staircase is peculiarly distressing. The patient stops abruptly, grasps at the first object that presents itself, and fixing the upper extremities in order to afford a fulcrum for the muscles of respiration, gasps with an aspect of extreme distress.

Incapable of lying down, he is seen for weeks, and even for months together, either reclining in the semi-erect posture supported by pillows, or sitting with the trunk bent forwards and the elbows or fore-arms resting on the drawn-up knees. The latter position he asumes when attacked by a paroxysm of dyspnœa—sometimes, however, extending the arms against the bed on either side, to afford a firmer fulcrum for the muscles of respiration. With eyes widely expanded and starting, eye-brows raised, nostrils dilated, a ghastly and haggard countenance, and the head thrown back at every inspiration, he casts round a hurried, distracted look, expressive at once of fright, agony, and supplication; now imploring, in plaintive moans, or quick, broken accents and half-stifled voice, the assistance already often lavished in vain; now upbraiding the impotency of medicine; and now, in a fit of despair, drooping his head on his chest, and muttering a fervent invocation for death to put a period to his sufferings. For a few hours—perhaps only for a few minutes—he tastes an interval of delicious respite, which cheers him with the hope that the worst is over and that his recovery is at hand. Soon that hope vanishes. From a slumber fraught with the horrors of a hideous dream, he starts up with a wild exclamation that "it is returning." At length, after reiterated recurrences of the same attacks, the muscles of respiration, subdued by efforts of which the instinct of self-preservation alone renders them capable, participate in the general exhaustion and refuse to perform their function. The patient gasps, sinks, and expires.

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[*] As the respirations are slower, they might be supposed deeper; but with the exception of those deep inspirations that are taken occasionally during, and more particularly at the *breaks* of sleep, the expansion of the lungs during sleep will be found by auscultation to be less than at other times.

Such are the sufferings, in their worst form, of an asthmatic from disease of the heart. We have now to take a more strictly medical view of the nature and progress of the asthmatic paroxysm.

If about to be severe, it is generally preceded by certain premonitory symptoms, which, though not so marked as in ordinary asthma, are much of the same nature—probably because derangement of the circulation and imperfect oxygenation of the blood are present in both. In cardiac asthma, however, many of the nervous symptoms, which characterize the ordinary varieties, are often deficient. One of the most common and efficient exciting causes of cardiac, as of all other asthmas, is derangement of the stomach, the irritation of which extends to the heart, and stimulates it to inordinate action. The irritation, according to the theory of Sir Charles Bell, is propagated through the medium of the par vagum, by which nerves the stomach and heart are closely associated as parts of the respiratory system. Accordingly, after a feeling of acidity, flatulence, or a load on the stomach from undigested food, often accompanied with abdominal distension, the patient experiences pain, weight and constriction in the forehead and over the eyes, accompanied (if the case be one of hypertrophy of the left ventricle) with throbbing of the temples and the sound of rushing waters. He feels a sensation, scarcely to be defined, of oppression, tightness and anxiety about the præcordia, frequently with slight palpitation. Sometimes the patient is drowsy, listless, restless, irritable, and impatient not only of society but of the attention of friends: these symptoms, however, are, in general, more prevalent in ordinary asthma. The signs described afford the experienced asthmatic well-known assurance of the approaching attack.

They gradually become worse and worse, especially after a meal, and eventually burst into a paroxysm. The time of the accession is less regular than in ordinary asthma, being more dependent on the state of the heart, which is liable to accidental excitement, from a variety of causes, at any moment. The fit, however, as in ordinary asthma, is, on the whole, more apt to supervene during the evening or early part of the night; and this, as appears to us, for two reasons: 1st. The recumbent position is unfavourable to respiration, the diaphragm being pressed upwards by the abdominal viscera, and the expansion of the chest being opposed by its own weight: 2d. During sleep respiration is not assisted by the will, which, during the wakeful state, from the sensation of want of breath being more acutely felt, is ever ready to maintain the body in the position most favourable to breathing. From the co-operation of these two causes, therefore, the circulation becomes so far embarrassed before the patient is aroused to a sense of his condition, that it can only be relieved by those violent efforts which accompany the asthmatic paroxysm. He accordingly awakes, generally with a start, in a fit of dyspnœa, accompanied either with violent palpitation, or a distressing sense of anxiety in the præcordia and great constriction of the chest, as if it were tightly bound. He is compelled to assume a more erect posture, and intensely desires fresh, cool air; the respiration is wheezing and performed with violent efforts of all the muscles of respiration both ordinary and auxiliary. The inspirations are high and accompanied with apparently little descent of the diaphragm, and the expirations are short and imperfect. The surface is chilly, the extremities are cold, and the face is pale and sometimes livid.

In cases in which the pulmonary congestion is only *temporary*, as in hypertrophy, either simple or with dilatation, there is no cough beyond a few slight and ineffectual efforts, producing little or no expectoration; and in such cases the fit subsides as soon as the engorgement of the heart and great vessels is relieved, which nature generally effects in two or three hours or less, by determining the blood to the surface and creating diaphoresis. In some instances we have known this termination to be regularly accompanied with a copious secretion of pale urine and a purging alvine evacuation.

The pulse, though at first full, strong, and bounding, may, during the worst of the paroxysm, become feeble and small, and the sound and impulse of the heart may be diminished; and this in cases even of hypertrophy; for the organ, being gorged to excess, is incapable of adequately contracting on its contents.

Such is the nature of an asthmatic fit when the pulmonary congestion is only temporary: the case is different when it is *permanent*, as in valvular disease and in some extreme cases of dilatation. For, then, there is often violent cough in suffocative paroxysms, accompanied, at first, with difficult and scanty expectoration of viscid mucus, but ending gradually in a copious and free discharge of thin, transparent, frothy fluid, occasionally intermixed with blood. This evacuation by disgorging the pulmonary capillaries, affords great relief to the cough and dyspnœa. As, however, the transudation of the matter to be expectorated into the air-passages, and its final elimination, are slow processes, paroxysms of this description are much more protracted than those of dry asthma from hypertrophy. They frequently last five or six hours, and we have known them persist, with only occasional remissions, for two, three, or more days. During the attack, the pulse is quick, small, and weak, often irregular and intermittent. In other forms of asthma the circulation through the heart is sometimes little disturbed; but this is always incorrect in reference to asthma from disease of the heart.

As the paroxysm subsides, the anxiety and constriction decrease, the respiration becomes less frequent, high, and laborious, and the pulse becomes slower, fuller, and more regular. But some degree of wheezing and tightness of the chest remains, and the paroxysm is very apt to return for two or three nights successively, and sometimes for a much longer period, until the lungs are freely unloaded by copious expectoration. It may, indeed, continue to recur at brief intervals for an indefinite period, or the patient may never be wholly exempt from some degree of asthmatic dyspnœa.

A severe asthmatic attack from disease of the heart is in general far more injurious in its consequences than one from an affection of the lungs.

Treatment of Disease of the Valves.—According to the foregoing principles, the exciting causes of valvular disease are, 1. over-tension of the valves by the force of the circulation; and, 2. inflammation, generally of the chronic kind. If it were possible to ascertain that these causes were in operation before they had actually occasioned an organic change, it would most probably be possible, in many cases at least, to counteract their effects and to prevent the formation of the disease. But, unfortunately, there are no positive signs of the latent mischief but what result from the disease already formed,—from the obstruction itself: and as, in the present state of our knowledge, we are not acquainted with any means of *removing* a valvular obstruction, the indications of treatment in this disease are, to prevent its increase, to counteract its tendency to induce hypertrophy and dilatation, and to relieve the symptoms of an obstructed circulation.

The remedies calculated to answer these indications are, in general terms, such as diminish the force and activity of the circulation, namely, occasional venesection to a moderate extent, an unstimulating and rather spare, though sufficiently nutritious diet, a tranquil life, with respect both to the body and the mind, and a good state of the digestive organs and alimentary canal.

If there be distinct signs of inflammation of the valves, to the above remedies may be added cupping or leeching on the præcordial region, with counter-irritants, as blisters, setons, issues, and the tartrate of antimony in the form either of ointment, or plaister with the empl. picis comp., and one-fourth of bees'-wax. We have also found digitalis very useful under these circumstances.

The extent to which any remedy must be carried can only be determined by the particular circumstances of each case. If, for instance, the patient be robust and plethoric, depletory measures may be pursued to a greater extent, and *vice versâ*. In general, if the valvular obstruction be not very considerable, and there be no hypertrophy or dilatation, and no tendency to plethora, an abstemious, light diet, and a scrupulously tranquil life, with an open state of the bowels, constitute all the prophylactic treatment that is necessary; and it is satisfactory to know that, by these means, danger may in many instances be completely averted. We have several times known patients with a moderate—even with a rather considerable valvular obstruction, attain the age of sixty, seventy, and even eighty, though the symptoms, judging from their account, had commenced in early life.

On the other hand, if precautionary measures be neglected, and hypertrophy or dilatation be superinduced, there is no organic disease of the heart, except adhesion of the pericardium, which tends more rapidly to its fatal termination. Hence the great importance of detecting and attending to disease of the valves in its earliest stage.

When the obstruction has become very considerable, has produced hypertrophy or dilatation, and is attended with dyspnœa, orthopnœa, and dropsy, the case is one of the most difficult that the practitioner can encounter. The most urgent symptoms, however, generally admit of being removed for a time; and the amelioration which takes place is sometimes truly astonishing. But, unhappily, the complaint seldom fails to return with greater or less promptitude. If the patient be youthful and of a robust constitution, the relapse may not occur for several months, especially if he has not been affected with dropsy, or after the first attack; but if he be of a shattered constitution, and have previously had severe attacks, the symptoms commonly return the moment he resumes any active occupations. In an ulterior degree of the disease, no sooner are the symptoms dispersed than they return, though the patient does not commit any indiscretion. When this is the case, the fatal event is never far remote, and may occur suddenly at any moment.

The remedies suitable for the treatment of the cases described are, abstractions of blood, purgatives, diuretics, sedatives, revulsives, a spare diet, and, what is paramount in importance to all, complete repose. These remedies, however, are not to be employed at random: so used, they might not only be unavailing, but directly destructive. It is only by adapting them to the character of the organic cause of the disease—only, in short, by a sound diagnosis, that they can be administered safely and effectively. It is necessary, therefore, to enter into further particulars relative to their nature and mode of application, and this may be most conveniently done by adverting separately to each.

Bloodletting.—When, with the valvular obstruction, there is hypertrophy or hypertrophy with dilatation, bleeding is generally necessary and may be repeated in small quantities, two, three, or more times, according to the strength of the patient and the urgency of the palpitation and dyspnœa. Some have recommended that bloodletting be practised in valvular disease in the unsparing manner of Albertini and Valsalva. The results of our own experience lead us to dissent entirely from this doctrine. Excessive bleeding cannot remove the valvular obstruction—cannot, therefore, cure the disease; consequently, its employment with this object is inappropriate. It is, moreover, directly injurious; as it reduces the patient to a state of debility which renders his circulation more liable to be embarrassed by the valvular obstruction, and his constitution more susceptible of the inroads of the malady. We have always observed bloodletting to be most serviceable in valvular disease when carried only just so far as to relieve the existing urgent symptoms without encroaching on the constitutional powers. It is advantageous to draw from four to eight ounces of blood occasionally during the intervals of the attacks, whenever dyspnœa becomes urgent and the heart's impulse more than ordinarily strong.

If, instead of hypertrophy, dilatation, either simple or attenuated, be conjoined with valvular disease, bloodletting is less necessary, and is more injurious if carried to excess. It should be resorted to reluctantly; only when imperiously demanded by excessive dyspnœa, which other means have failed to relieve; the least quantity that suffices to afford relief should be drawn; and the depletion should not be repeated if it can possibly be avoided. Attention to these rules is still more necessary in the aged. The greater the valvular obstruction, the greater is likely to be the embarrassment of the circulation, if the power of the heart and system be reduced below a certain point. Of this we feel satisfied from reiterated observation.

Diuretics.—When there is dropsy and a scanty secretion of high-coloured urine, remedies of this class are of the greatest utility. In most cases, indeed, the dyspnœa, palpitation, cough, &c. decrease in the same proportion as the urine increases and the dropsy disappears. Nor is it only when dropsy has actually appeared, that diuretics are useful. They are remarkably beneficial in an anterior stage of the disease; for, by drawing off the serous portion of the blood, they diminish the quantity, without deteriorating the quality of that fluid, and thus relieve palpitation and dyspnœa and obviate infiltration, without materially reducing the patient.

Diuretics are very variable in their effect, a weaker sometimes answering perfectly after a stronger has failed. When, therefore, one does not speedily produce the effect, another should be tried. The surest way is to employ several at once. A pill consisting of three grains of blue pill, one of pulv. scillæ, and one or half of one of pulv. digitalis, given three or four times a day, seldom fails; or it may be given once or twice a day with a draught of tr. scillæ, mxx. sp. ætheris nit. and sp. junip. C. comp. āā. ʒss. ad ʒi, in dec. spartii. ℥iss. twice or thrice a day. We have sometimes found all these fail until ʒii or ʒiii of infusion of digitalis were added to the draught. Its effect, however, must be carefully watched. Supertartrate of potass is always a valuable auxiliary, and may be given to the extent of ʒii or ʒiii in twenty-four hours, either in the form of a drink, of electuary, or in the above draughts.

Sometimes diuretics cannot be made to produce any effect: it is then necessary to resort to purgatives, as will presently be explained.

In very feeble and reduced patients, dropsy should not be too rapidly evacuated; as the process is attended with a degree of exhaustion, which is often fatal. The period, indeed, immediately succeeding the disappearance of dropsy is, on this account, one of the most critical. The older physicians were aware of this, and ascribed it to the accumulation of the fluid in the internal cavities. Such, however, is not always the cause; for, in cases terminating fatally at the period alluded to, we have frequently ascertained, both by auscultation, percussion, and post-mortem examination, that the internal and external dropsy disappeared simultaneously.

Purgatives.—When diuretics do not remove dropsy, purgatives will frequently produce that effect. The two classes of remedies may, indeed, be combined with great advantage, when the patient is strong enough to bear them. The drastic hydragogue purgatives are the most efficacious, as tinct. jalapæ, elaterium, &c. The effects of the latter are sometimes truly astonishing. We have seen an extreme universal anasarca removed by it in three or four days. The remedy is apt, however, to be excessively violent in its operation, and should, therefore, only be given to strong subjects. As its effect varies in different individuals, it should be tried at first in small doses, as from one-eighth to one-fourth of a grain. With caution it may be carried to two grains. We generally give it in the form of pills with pulv. capsici, which obviates its griping effect; sometimes we add a grain or two of calomel. A single pill should produce six or eight watery evacuations, and it may be given two or three mornings successively, or every second or third morning, according to the strength of the patient. All the other purgatives may be useful, especially such as produce watery evacuations. A very good one is, the infusion of senna, with tinct. jalapæ ʒi, and tartrat. or acetat. potass. ʒii.

An occasional purgative is sometimes very beneficial though there be no dropsy; as, for instance, when an attack of palpitation or asthma has appeared to be induced by an excess of bile, by undigested food, or by acrid or long detained fæces in the intestines. Under such circumstances a purgative often alleviates, and sometimes terminates the attack. Except with a view of removing dropsy, or plethora in cases where hypertrophy is superadded to valvular disease, frequent, systematic purging should be avoided on the same principle as bloodletting: viz. lest it should too much reduce the system.

Diaphoretics.—When there is anasarca, cutaneous transpiration contributes very powerfully to remove it. A lady, lately under our care, and subject to frequent attacks of anasarca, often found the swelling disappear in twenty-four hours with copious perspiration. Strong stimulating sudorifics, however, should be avoided, as they are both too debilitating and too exciting to the circulation. Gentle saline diaphoretics are the best, and their effect may be promoted by warm clothing, hot diluents, and the occasional use of the warm bath to keep the skin soft and open. When there is no anasarca, and no *permanent* pulmonary engorgement and expectoration, diaphoretics, beyond warm clothing, are of little use, except occasionally, to relieve asthmatic attacks. For the latter purpose we have generally found them of great utility; but, as internal remedies of this class are slow in their operation, they should be resisted by fomenting the hands and feet, or immersing them in warm water, at the same time keeping the trunk covered. If perspiration can thus be gently elicited without heating and stimulating the patient, it is one of the most effectual means of curtailing a paroxysm. Nature herself indicates the remedy; as a paroxysm of asthmatic palpitation often terminates with profuse spontaneous diaphoresis.

Emetics.—These are extremely useful or extremely pernicious according as they are judiciously given, or the reverse; and it is only by a sound diagnosis that the practitioner is enabled to judge whether they can be safely administered or not. When there is an undigested, bilious, or acid load on the stomach, exciting a fit of palpitation, its removal by an emetic often affords instantaneous relief. But the medicine should be one which simply evacuates the stomach without much shaking the system, as ipecacuan with sulphate of copper or of zinc, but by no means tartrate of antimony. If the disease of the heart and the embarrassment of the circulation be great, even such an emetic as the above cannot be given without danger of aggravating all the symptoms. We have seen emetics, administered under these circumstances, exasperate and prolong the paroxysm, increase the frequency of its recurrence, and speedily bring the patient to his grave. They may even cause death during the paroxysm. Their dangerous effect consists in their increasing engorgement of the heart and the obstruction of the circulation. For this reason they should not be ventured upon in disease of the heart simply for the object of promoting expectoration—an object which may be much more safely and effectually accomplished by other means. In ordinary varieties of asthma, especially that from pituitary catarrh, they are peculiarly beneficial by promoting the expectoration of the immense accumulations which take place in the lungs. Hence the importance of carefully distinguishing between these two classes of cases. (See Asthma.)

Though emetics are objectionable except for the purpose of evacuating the stomach, small doses of ipecacuan or tartrate of antimony are useful as diaphoretics and expectorants. When the obstruction of the circulation is great, they cannot safely be carried to nausea, as this state is apt to bring on a languor of the circulation which leads to the formation of polypi in the heart. In the case of a lady under our care, and affected with extreme contraction of the mitral valve, nausea came on unexpectedly at the moment when she had just been relieved of an excessive dropsy, and was followed by suffocating dyspnœa, an imperceptible pulse, and other symptoms indicating the formation of a polypus in the heart. She died in a week, and the polypus was found.

Puncturing.—When dropsy has failed to be relieved by other means, and the cutaneous tension has become intolerable, the practitioner is compelled to resort to puncturing. We say compelled, because the remedy is a last and dangerous resource. The danger, however, may be considerably diminished by making small punctures with a grooved needle, and allowing the fluid to ooze slowly during four or five days or a week. When incisions are made with a lancet or scalpel and the fluid is evacuated quickly, as in twelve to forty hours, the patient, according to our observation, generally dies. This event sometimes results from sloughing of the incisions, but more commonly from exhaustion induced by the sudden evacuation of the fluid. In one instance we saw the patient die from hemorrhage. There is less danger of mortification when the incisions are made above the knee.

Setons, issues, and blisters on the præcordial region, are of no use unless there be chronic inflammation of the heart: the pain and irritation which they occasion are often injurious. The emplast. belladonnæ, however, is often very serviceable in tranquillizing the heart and allaying nervous pain.

Expectorants.—When there is permanent engorgement of the lungs, free expectoration always affords relief; we have seen great dyspnœa result from its suppression by an incipient catarrh, a dry sharp atmosphere, and even a dose of laudanum. Many asthmatic fits dependent on valvular obstruction, terminate with copious expectoration of a thin sero-mucous fluid. This secretion, therefore, should always be maintained when there is a tendency to it.

As the stomach in disease of the heart is extremely fastidious and delicate, oily, sweet, and nauseous expectorants should be carefully avoided. Squill with an acid, as the acetic or nitric, has been found by experience to be the most efficacious remedy of this class. Vinegar of squill has been highly extolled by Floyer, and tinc. scillæ, gtt x — acid nitrici, gtt vi — extr. hyoscyami, gr. iii — aquæ puræ ℥iss, as a draught every three or four hours during the paroxysm, is the favourite prescription of Dr. Bree for the asthmatic paroxysm of his first species, i. e. "from effused serum in the lungs." Mist. ammoniaci, though in general too heating for the young, is a useful expectorant for the old, when sufficiently diluted. The same may be said of the decoction of seneca. Ipecacuan and tartrate of antimony in small doses, are valuable expectorants as well as diaphoretics. Phlegm accumulates during sleep, and it is for this reason principally, that the patient suffers more on first rising in the morning. The elimination of the phlegm is greatly facilitated by a cup of any hot fluid, especially coffee; and, to allay the nervous irritability of the lungs which generally leads to coughing before the phlegm is sufficiently detached to be thrown off with ease, we have found from half a drachm to a drachm of tinct. camphoræ comp. of great utility.

Expectorants should not be constantly given in disease of the valves, but only to relieve an asthmatic paroxysm, or to restore the pulmonary secretion when accidentally suppressed.

Gases.—The effects of atmosphere on cardiac, as on other asthmatics, are so diversified that they are scarcely reducible to any general rule. When, however, expectoration is habitually copious, a moist warm atmosphere favours it, probably by relaxing the pulmonary vessels. A clear, sharp air, on the contrary, checks it, and thus increases dyspnœa. Again, the latter air relieves dyspnœa when it depends, not on engorgement of the lungs, but on a languid action of the heart as in dilatation with attenuation; and this it does by stimulating and bracing the system, and causing a freer circulation through the lungs and more perfect arterialization of the blood. Electricity appears to act in the same way when it produces any good effect. We have never tried the inhalation of oxygen, but it is highly commended by Dr. Beddoes and others; and it is rational to think that, in suffocative dyspnœa from retardation of the blood in the lungs, it would relieve the anxiety and straitness by causing a more perfect arterialization.

Smoking tobacco or stramonium sometimes affords extraordinary relief to cardiac, as well as other asthmatics; and this it does partly, perhaps, by increasing the bronchial and salivary secretion, but more especially by its sedative and antispasmodic effect in tranquillizing the nervous system, resolving the bronchial spasm, and allaying the sensation of want of breath. The experience of the patient is the only certain criterion of its utility. In many cases we have certainly seen it prejudicial. Its utility has appeared to us the greatest in those who are of a highly nervous irritable habit, and in whom asthma displays most of the spasmodic character.

Antispasmodics. — While the Cullenian doctrine, that spasmodic constriction of the bronchi was the sole cause of asthma, prevailed, remedies of this class were in great vogue; but experience has not realized the high expectations to which the theory gave rise. Antispasmodics are useful auxiliaries, but cannot be depended upon alone. When they not only resolve bronchial spasm, but contribute to diffuse, equalize, and calm the circulation in disease of the heart, they are beneficial: when they fail to produce the latter effects, they are of little use. In an incipient paroxysm from slight disease of the heart, we have frequently found a draught of sp. ammoniæ aromat. or fœtid. with æther and laudanum, promptly restore the colour to the face and warmth with perspiration to the skin, with general relief. In one case of hypertrophy with dilatation and adhesion of the pericardium, a glass of gin and water had always the effect. Sometimes gr. x to xv. of carbonate of ammonia is more efficacious than any other remedy. The solution of assafœtida has also appeared to us to be very powerful, but few patients can be prevailed upon to take it.

In most instances, the antispasmodic, whatever it be, is productive of eructation, and to this, in some cases, we partly attribute its beneficial effect; as flatulence alone suffices to occasion a paroxysm. The eructation sometimes occasioned by the remedies themselves, especially æther, must not be mistaken for the extrication of the real flatus.

When the paroxysm is fully established, and is connected with a great degree of organic disease of the heart, antispasmodics alone have little or no effect in affording relief; and large doses of sedatives, as opium, hyoscyamus or conium, or of stimulants, as æther, often prolong, rather than curtail the fit. In conjunction with other means, however, moderate doses may be tried, and if the patient feel himself relieved, they may be continued.

Digitalis, according to our experience, is an excellent adjunct to an antispasmodic draught: gtt xx or xxx of the tincture may be given every three or four hours, with gtt vi to x of tinct. opii, or if that disagree, of hyoscyamus, in cinnamon water. Care should be taken to intermit the digitalis before its specific poisonous effect is produced.

In suffocative, agonizing orthopnœa, when the restlessness and jactitation of the patient aggravates the distress, we have often found narcotics afford great relief simply by inducing sleep and a diminished sensation of suffering.

Stomachics. — The correction of dyspepsia is of the first importance in organic disease of the heart; as palpitation is often dependent upon it alone. Two gentlemen under our care for hypertrophy, with dilatation, never suffered dilatation, dyspnœa, or headach except when affected with acidity, flatulence, &c. Such cases are often mistaken for "the stomach" alone — a most dangerous mistake: of the individuals alluded to, for instance, one had two fits of apoplexy, and the other was repeatedly rescued from it by prompt cupping. When there is acidity, antacids, of which chalk has appeared to us the most certain, should be freely given every third or fourth hour, its constipating effect being counteracted by the previous or simultaneous exhibition of a few grains of rhubarb. We have already stated that the stomach, if loaded, should, in the first instance, be evacuated by a gentle emetic, copious draughts of tepid water or chamomile tea being taken to insure its full effect. This treatment will generally terminate an attack dependent on dyspepsia, in two or three days and sometimes in as many hours. Towards the close of the attack, sedatives, as opium or hyoscyamus, assist by tranquillizing the nervous system.

Not only antacids, but also acids themselves, have been proved by experience to correct acrimony of the stomach accompanied with flatulence and distension. Their efficacy is the greatest when the acrimony is bilious, and then they act, in all probability, both by neutralizing the alkaline qualities of the bile, and exciting the stomach to an altered and more healthy secretion. That they possess the latter property is to be inferred from their correcting acidity and preventing fermentation even when there is no bile. A sour apple is a popular remedy for heart-burn. The acids to be employed, are, the mineral acids much diluted, and also the acetous. Saccharine acids, as oxymel, acescent fruits, raspberry vinegar, &c. should be avoided, as they are apt to be more injurious by their fermentation, than beneficial by their acid qualities. Acids need not be tried till antacids appear to have failed.

To give tone to the stomach, bitters are very useful. Infusions should be employed during an asthmatic paroxysm, as tinctures are too stimulating; but after the second or third day, when the patient begins to amend, either the one or the other may be used. The bitters may be conveniently conjoined with the antacids, acids, &c. Griffith's mixture is very beneficial in debilitated subjects, in the intervals between the fits.

Tonics.—When disease of the heart is of the hypertrophic kind with increased activity of the circulation, tonics are obviously inappropriate: when it is of the dilated kind, with languor of the circulation and atony of the system, they are remedies of the greatest value, and it is mainly by them that a complete cure can be effected. All the tonics, of which the preparations of iron are the best, may be used according to the discretion of the practitioner. Of the advantages of bracing air and exercise and of the shower-bath, we have spoken in the article Dilatation. A discreet use of the cold bath also is highly beneficial. (See Asthma.)

Such are the remedies to be used in the treatment of organic disease of the heart. It cannot be too strongly inculcated on the practitioner, that the disease, when remediable, is not to be cured by relieving the paroxysm, but by preventing its occurrence. Every attack gives the patient much ground to retrace; a single attack may undo the progress of a year, and death may result from the indiscretion of a day. Great firmness is necessary on the part of the physician to impress this strongly on the mind of the patient; for the latter, when his feelings are easy, can seldom—very seldom—be made to comprehend that the necessity for his rigid adherence to medical, regiminal, and dietetic discipline is equally imperative.

The practitioner, however, is not the less to study the means of relieving the paroxysm; not only because in it he has perhaps the greatest of human sufferings to alleviate, but because by curtailing the attack he increases the chances of an ultimate cure.

[See on all this subject, Hope *on Diseases of the Heart*, edit. cit. p. 341.

J. Hope.

HECTIC FEVER. (See Fever, Hectic.)

HEMERALGIA. (See Nyctalopia.)

HEMICRANIA. (See Headach.)

HEMIPLEGIA. (See Paralysis.)]

HEMORRHAGE, (*αἱμοῤῥαγία*, from *αἷμα*, *sanguis*, and *ῥήγνυμι*, *rumpo*,) loss of blood. The purpose of this article is to present a summary view of the knowledge we possess, and of the doctrines now generally received, concerning *internal hemorrhage*. The term is here employed in its most comprehensive sense, as signifying the passage of the blood beyond its natural channels—beyond or out of the vessels that are appointed to contain and convey it in the healthy living body. Under this definition it is indifferent whether the extravasated blood remains pent up within the body or not.

The epithet *internal* is however prefixed, in order to limit the subject to those forms of hemorrhage which fall within the province of the physician, and to exclude all consideration of those cases which, whether they are the result of disease, or of accidental injury, or of surgical operation, are capable of relief by mechanical expedients only. These latter cases are sometimes, though not perhaps with much propriety of language, comprised under the general title of *surgical* hemorrhage, in contradistinction to the former, which are then classed as being *medical*.

In what has been called surgical hemorrhage the blood proceeds from some large vessel, situated within the reach of the eye and the finger. The principles upon which the loss of blood in such cases is arrested or prevented are well understood; and in no part of the rapid progress of modern surgery has the union of well-contrived observation with sound reasoning been productive of more admirable results. With a few remarkable exceptions, such as the protection afforded against small-pox by vaccination, or against sea-scurvy by the use of lemon-juice, there is not perhaps any single improvement in the art of healing by which so many lives are saved, and so much human suffering is relieved or averted, as by the scientific application of the ligature upon the larger blood-vessels.

That kind of hemorrhage which falls to the care of the physician is less perfectly understood, and is controllable with less certainty. It comprehends, however, a large and very formidable class of diseases. In some of these the effusion of blood is an accidental symptom only; of many it forms the principal sign or circumstance; and there are others in which it may be considered, in reference to our united means of investigation, as constituting the whole disease.

The accidental injuries to which the animal frame is continually exposed must have furnished mankind, from the earliest times, with frequent illustrations of the striking fact that the mere loss of blood, when it exceeds a certain amount, implies also the loss of life. They who have seen their fellow-men bleed rapidly to death from external wounds would be strongly impressed with the great importance of the fluid, the removal of which from the body led to an event so appalling; and they would look with interest and alarm upon the rarer instances which might occur of bleeding from internal and unseen parts. A natural but deceptive analogy, uncorrected by pathological knowledge, would almost unavoidably lead them to this further inference, that *all* hemorrhage—hemorrhage, the source of which they could not see, as well as that the source of which they were able to examine and appreciate,—proceeded from an opening in the sides of some one (or more) considerable blood-vessel.

It is true that some hemorrhages, of which the origin is, during life, beyond our vision and means of inquiry, do result from the rupture of vessels of a certain magnitude; but it is no less true that in the greater number of instances of bleeding from the interior of the body, there is no lesion, capable of being detected by dissection, either of the veins or the arteries; but the blood is poured out by what is called exhalation, and proceeds from those ultimate ramifications of the minuter blood-vessels which constitute the capillary system

This remarkable and important piece of knowledge was ascertained long since by Morgagni; it was more formally and completely demonstrated by Bichat; and it has been so amply illustrated by subsequent observation that it may seem to be a fact almost too trite to dwell upon. Yet, judging from the writings and language even of medical men, it does not appear to be so generally known or acknowledged as it ought to be among *them*; and among unprofessional persons the old errors upon this subject prevail almost universally. To break or burst a blood-vessel, in the most literal meaning of those words, is thought by the public, and by some at least of the profession, to be a misfortune of very common occurrence; yet relatively to the frequency of hemorrhage, it is certainly a very rare one.

Bichat explicitly propounds the doctrine that in certain hemorrhages the blood escapes from the capillary vessels by a process which, in pursuance of his example and to avoid circumlocution, we shall call that of exhalation. He rests this opinion upon several distinct considerations, some of which are perhaps more curious than conclusive.

Thus he states that if the uterus of a female who has died during the menstrual period, be carefully examined, no erosion of its inner surface or of its blood-vessels can be seen, nor any of those numerous cicatriculæ which, he argues, must have been formed, if each occurrence of the catamenial discharge had resulted from a rupture of those vessels.

The rupture which he here supposes is the simultaneous laceration of numberless capillary blood-vessels. Such laceration, if it took place, would indeed account for the discharge; and it has been assumed in explanation of some morbid hemorrhages. It is by no means certain, however, that it would give occasion, especially on a mucous surface, to visible scars. Punctures, even of the skin, made by fine needles which would wound the blood-vessels, do not, we imagine, however numerous they may be, leave any such traces of their former presence.

He adds, that if we submit the same uterus to pressure, and mark closely what happens, we see minute drops of a red fluid exude from its inner surface; and if we then wipe these drops away, the membrane whence they proceeded appears to be perfectly entire.

Whatever weight this argument may possess is strengthened by the actual observation of the process of menstruation in the living uterus. Dr. James Hamilton of Edinburgh is in the habit of relating, in his lectures, the case of a patient who was once under his care, and whose complaint appeared to him so instructive upon this very point, that he sent her into the clinical wards of the infirmary, that the students might have an opportunity of witnessing it. This woman was afflicted with enlargement and complete prolapsus of the uterus. The professor describes the inverted womb as having hung down between her thighs like a quart bottle; it could not be replaced; and it was tense and hard, except during the period of menstruation, which took place regularly. At those times it became soft and flexible, and the menstrual discharge was seen, by numbers of medical men and of students, to issue *guttatim* from the exposed surface.

As, however, the process of menstruation cannot be looked upon as a morbid process; as, in the unpregnant female, during a certain portion of her life, it is not only consistent with perfect health but actually essential to it; and as the fluid so poured out is not strictly blood; the analogical argument drawn from the preceding facts in favour of hemorrhage by exhalation, though it may afford a strong presumption, is not decisive.

But the deficiency here noticed is supplied by what is observed in those cases (rare indeed, yet well authenticated) of actual cutaneous hemorrhage, where a dew of blood appears upon some portion of the skin, is wiped away, and re-appears, with no perceptible alteration of the affected surface beyond some occasional variation in its colour.

Another of the arguments advanced against the possibility of rupture or laceration in such cases is drawn from the well-known fact that the flow of blood, or of the catamenia, will sometimes continue for a few moments, then cease, and again recur; and that these alternate changes may happen several times in the course of a single day; so that, upon the supposition against which Bichat is contending, the wounds of vessels must heal and reopen at every change.

This reasoning is obviously both inconclusive and erroneous. We know that the cessation of hemorrhage from a *torn* vessel may and often does result from other causes than cicatrization; that even when the vessel is of considerable size, and the laceration extensive, the bleeding may occur, and pause, and occur again, and that repeatedly, within a short space of time.

Bichat did not overlook that species of evidence by which alone, after all, the existence of hemorrhage, independent of any rupture of vessels, can be satisfactorily established. He states that he had frequently dissected the bodies of persons who had died from hemorrhage; that he had examined, according to the nature of the case, the surfaces of the bronchi, the stomach, the intestines, or the uterus; and that, although he took the precaution of washing them clean, and even of submitting them to maceration before he inspected them with a microscope, he never could detect the slightest appearance of erosion.

Numerous and conclusive observations of the same kind have been accumulated by the zealous pursuit of morbid anatomy for which the present age is so remarkable; and in this way direct proof has been obtained, not only that internal hemorrhage may take place from the surfaces of membranes by exhalation, but that this is the mode in which it most commonly happens; that the effusion of blood by any of the natural outlets of the body can seldom, excepting in the cases of aneurismal disease, be explained by the detection of a broken blood-vessel.

Where hemorrhage, for example, has occurred so profusely from the stomach or bowels that the death which ensued has been sufficiently accounted for by the mere loss of blood, the whole tract of the alimentary canal has been diligently scrutinized, and has exhibited no breach of surface, nor any perceptible alteration of texture. Sometimes its mucous membrane appears, here and there, of a red colour, and as it were charged with blood; sometimes it is pale and transparent, while the vascular network visible immediately beneath it is gorged and turgid; sometimes the whole is colourless, the same network of vessels having been completely emptied by the previous hemorrhage; and sometimes again (and this is very illustrative of the mode by which the blood has issued) vast numbers of small dark coloured masses, like grains of fine sand, can be made to start from the surface of the membrane by slight pressure. There can be no doubt that these are minute portions of blood, which had remained and coagulated in the vessels or apertures forming the ultimate channels of the hemorrhage.

These views receive an indirect but strong support and illustration from the well-known circumstance, that certain hemorrhages are preceded and followed by an increased efflux of the fluids which belong to the surface concerned. In hemorrhages from the mucous membranes this succession of events is in some persons habitual. First, there is an augmented flow of mucus alone, then of mucus tinged with blood, then of blood alone; and the hemorrhage ceases by a similar but inverse gradation towards a mucous drain, which itself at length decreases and disappears. In such cases (there being no manifest erosion or organic change) it is apparent that the blood proceeds from the same vessels or apertures, which in health pour out the natural fluids of the part—mucus, serum, or sweat. There seems no more necessity, under the action of disease, for a rupture of vessels to give exit to the blood than to give exit to these fluids. What the vessels or outlets to which we give the name of exhalants really are—how they are distributed and arranged—in what manner they are connected with the ordinary capillary circulation of red blood—or under what influences they are placed—are points concerning which we have little or no certain knowledge. We know, indeed, that such channels must exist, though we cannot demonstrate or see them; and that, whilst the health is entire, they do not allow the blood, as such, to pass through them.

Several kinds of hemorrhage by exhalation have been enumerated by pathologists, according to the different morbid conditions with which the efflux of blood is associated. The chief distinctions of any importance may, however, be almost all comprised within the two general classes of *idiopathic* and *symptomatic* hemorrhage.

Idiopathic hemorrhage is that which occurs without any discoverable change of texture, either in the part from which the blood proceeds, or in any other part capable of influencing the circulation in the former, by reason of some intelligible connection of structure, or function, or mutual relation. The epistaxis of young persons affords an example of this kind of hemorrhage, to which the terms *spontaneous* and *essential* are also sometimes applied.

Symptomatic hemorrhage, on the other hand, is that which depends upon some notable organic disease. It comprehends all cases of hemorrhage by exhalation not embraced by the definition just given of idiopathic hemorrhage. It may be said to be *primary* when the organic disease upon which it depends is situated in the very part which gives issue to the blood; *secondary*, when the organic disease is situated in some other part more or less distant from the former.

We have instances of the primary species in hemorrhage from the stomach, or from the uterus, dependent upon incipient scirrhus of those organs; from the pleuræ or peritoneum, under violent inflammation; from the mucous membrane of the air-passages in intense bronchitis.

Examples of the secondary species occur in hemorrhages from the bronchial membrane in consequence of the presence of crude tubercles in the lungs, or of organic disease of the heart; and in hemorrhages from the mucous membrane of the stomach and bowels in consequence of disease obstructing the circulation through the spleen or liver.

The proximate cause (as it is called) of idiopathic hemorrhage—or the essential condition of the facts concerned in its production—is involved in much obscurity. There appears good reason for believing that it is different in different cases. It is certain that in very many instances the hemorrhage is preceded and accompanied by an unusual accumulation of blood in the capillary vessels of the part. In the secondary species of symptomatic hemorrhage this kind of sanguine congestion is also almost always present, and is then owing to some mechanical impediment of the venous circulation. The causes of such congestion antecedent to idiopathic hemorrhage are less obvious, especially when the congestion is partial.

Since the time of Stahl and his disciples, the existence of local plethora has been fully recognised as constituting a frequent element of disease. Some of the distinctions introduced by him were doubtless fanciful: it is certain, however, not only that local congestion is of common occurrence, but also that this unequal distribution of the blood in the capillary vessels may happen in several ways, and from various causes, easily distinguishable from each other. M. Andral, the most recent, and probably the most able writer on this subject, describes three different conditions under which local plethora (or, to use his own convenient though somewhat uncouth phraseology, *hyperæmia*) may occur in the living body.

One of these conditions has been already adverted to, that, namely, in which the return of the blood from the capillary vessels towards the heart is impeded by some mechanical obstacle. Hyperæmia of this kind may be strictly local. It may be confined to a single limb when the principal venous trunk belonging to that limb is compressed, or otherwise diminished in size. If there be disease of the liver, of such a nature as to prevent a free passage of the blood through that organ, congestion will take place in all those parts of the capillary system from which the blood is conveyed by the veins that ultimately combine to form the vena portæ. The force of gravity alone will be sufficient to induce venous congestion in parts of the body in which, under ordinary circumstances, the circulation through the veins is aided instead of being opposed by that force. If the head, for instance, be suffered to hang downwards for a certain time, we see the unequivocal signs of such congestion in the tumid condition and the purplish colour of the lips, cheeks, and eyelids. When an impediment to the free transmission of blood exists in the heart itself, a tendency to stagnation is produced, first in the venæ cavæ, then in the smaller ramifications by which these veins are fed, and at length in the general system of capillary vessels; and thus general hyperæmia from a physical cause will ensue, the parts which are the most vascular being also the most readily and the most completely gorged.

The two other forms in which local plethora or hyperæmia may present itself are called respectively active or sthenic hyperæmia, and passive or asthenic.

The first of these proceeds from some irritation or stimulus, either applied to the part itself, or influencing that portion of the nervous system, by which the vital actions of the part are regulated.

The irregular distributions of blood which fall under this head are not always morbid. In a certain degree and for a certain time they may consist with the most perfect health. The deep flushing of the cheeks and forehead under strong mental emotion, and the general redness of the skin produced by violent exercise, are familiar illustrations of this healthy congestion of capillary vessels. A similar congestion may be produced at will upon the surface of the body by mechanical or chemical stimuli—by friction for example, or the application of heat. If these causes of the local accumulation of blood be intense in degree, or continue to be applied for a certain time, the congestion is accompanied by disturbance of the functions of the part—by pain, or by other well-known changes.

But local congestion of this active kind, and essentially morbid in its character, is of frequent occurrence in various organs of the body; and in many of these cases there is no obvious exciting cause of such an unequal distribution of the blood. We have evidence, indeed, in the blush of shame or anger, and in the paleness of fear, that the capillary blood-vessels may be filled to excess, or completely emptied, by causes operating through the brain and nerves; and it seems probable that morbid congestions, which are sometimes separated from those consistent with health by shades of difference not easily discriminated, may also be occasioned through the agency of the same nervous system.

Local hyperæmia of the active kind seems in many instances to form a part, or rather to be an effect, of a plethoric condition of the whole body. To understand precisely what is meant by a state of general plethora, it is necessary to remember the physiological doctrine that the whole vascular system is constantly distended beyond the size of the vessels when free from any distending force. When the arteries are in any way emptied of their contents, their diameter diminishes, and frequently they become even impervious. The general notion of plethora is that this state of distension is greater than what is ordinary or natural. It is easy to conceive that in persons who live fully, lead an inactive life, and sleep much, there should be a greater quantity of blood formed, and consequently a preternatural distension of the vessels. Fulness of habit and a florid complexion are marks of the existence of general plethora; of superfluous blood being partly expended in the formation of that substance which is the least necessary in the animal economy, namely, fat, the capillary vessels of the face partaking of the general fulness or vascular distension present in all parts of the system. We trace the existence of general plethora also in the character of the diseases most prevalent in those who are the subjects of it, in the tendency especially which they evince to hemorrhage and to inflammation.

A state of general plethora is, however, by no means essential to the production of local congestion, which, on the contrary, is of frequent occurrence in persons who are pale, spare, and deficient in blood. Nay, a remarkable proclivity to an unequal distribution of blood in the capillaries, has been observed in those who, from accident or disease, have already lost large quantities of that fluid. The general symptoms, however, which accompany local hyperæmia in these two opposite conditions of the system, undergo proportional modifications.

The simple existence of local congestion of the active kind, and independent of any mechanical impediment, is sufficient to show that the blood, after it has entered the capillary system, is no longer under the sole influence of the heart's impulse; but that its subsequent motion is mainly determined by a power of contraction belonging to the smaller blood-vessels themselves. It is upon a supposed defect of such power—a diminished tonicity of the vessels, that the doctrine of asthenic or passive hyperæmia is founded.

The efficacy of the assigned cause in the production of hyperæmia is perhaps less obvious here than in the cases which have just been considered. The following are some of the observed facts from which its actual operation has been presumed.

In persons enfeebled by age or by disease, the lower parts of the legs, the ankles, and insteps, and the skin which forms the surface of old scars, are often habitually purplish or violet-coloured. This cannot be owing to the mere influence of gravity, because that remains constant at all ages and in all conditions of the system. The peculiar colour, denoting a sanguine congestion of the part in which it is visible, may indeed be diminished sometimes by placing the limb in the horizontal position, whereby the weight of the blood in opposing its own return from the capillary vessels being removed, the action of the vessels themselves again suffices for its propulsion. But the congestion in these cases often disappears upon the employment of friction, or of stimulating application, which would be powerless against any mechanical obstacle in the larger veins, and which would tend to increase the afflux and accumulation of blood in active hyperæmia.

In the same way, the large, flabby, and livid granulations which often appear on the surface of indolent ulcers, are made to contract, and to assume a more healthy and florid hue by local stimulants, which quicken the previously languid circulation by exciting (it is supposed) the vital action of the minute blood-vessels.

There is no part of the body which affords more striking and unquestionable evidence that blood may accumulate unequally in the smaller vessels, than the eye. The conjunctiva and sclerotica, through which, while healthy, colourless fluids alone circulate, are traversed, under various forms of disease, by innumerable vessels bearing red blood. It is notorious that in certain cases the application of any stimulant to the surface of the organ will increase the existing redness, multiply the number of visible vessels, and aggravate the disease. These are cases of active hyperæmia, dependent upon irritation which is still subsisting. It is equally well known that the same vessels are liable to congestion under very opposite circumstances. They are then seen to be distended with blood, tortuous, and varicose; and the redness is browner, and less vivid than before. In this kind or stage of vascular fulness, emollient applications do harm rather than good; while strongly astringent and even highly irritant substances will often promptly dissipate the vascularity. There are, again, cases illustrative of hyperæmia of the asthenic kind The strong topical irritants restore the feeble and relaxed vessels to their natural elasticity, stimulate them to contract upon their contents; and to force onwards the blood, which they cease to admit from the arteries, and the redness disappears.

In the examples here touched upon, the asthenic character of the local congestion is denoted by the peculiar aspect of the altered parts; by the circumstances under which the congestion happens; and, above all, by the nature of the measures which conduce to its removal. The doctrine of asthenic hyperæmia admits of extensive and most important application, in regard to various internal morbid conditions of the body. But any further prosecution of this part of the subject would be irrelevant to the present inquiry. The preceding observations have been made with the view of demonstrating or of rendering probable certain differences in respect to the manner in which the capillary blood-vessels may become unequally loaded, and of elucidating thereby some of the modes of hemorrhage; of showing in particular, that a predisposition to hemorrhage may arise under very different conditions; that it is far from being always of one and the same character, or susceptible of relief by the same kind of treatment. The fact, then, which is beyond dispute, of the frequent pre-existence of local engorgement and distension in the capillary circulation, gives support to the hypothesis that (in certain cases at least) the issue of blood results from pressure, whereby the blood in substance is urged through passages naturally impermeable by its red particles, but now mechanically dilated in consequence of the *vis a tergo*. Although the dilatation cannot be made sensible to the eye, this seems the simplest and most obvious explanation applicable to some forms of idiopathic hemorrhage, and to the secondary species of that which is symptomatic. That blood may be thus exhaled, independently of any disease in the vessels themselves, we know from experiments made on animals, and from the observation of what sometimes occurs in the healthy human body. Boerhaave produced hemorrhage into the intestinal canal of a living dog, by placing a ligature on the vena portæ. An extreme turgescence of the whole venous system is one of the results of sudden strangulation. Dr. Yelloly accordingly found such turgescence conspicuous in the bodies of five criminals who had recently suffered death by hanging; and in two of these instances, blood in considerable quantity had exuded from, and coagulated upon, the mucous membrane of the stomach.

Hemorrhage has been ascribed also to some alteration (other than that which we may conceive to be produced by the distension of plethora) in the vessels or apertures through which the healthy exhalations are transmitted. The change is considered as being of the nature of morbid debility or relaxation. That such a state may sometimes exist is not unlikely; but as we are altogether ignorant of the natural condition of these outlets, it is difficult to reason about the alterations to which they may be liable in disease. This hypothesis derives its principal support from the occasional efficacy of astringent substances (either locally applied, or taken into the system) in checking the effusion of blood, when artificial bleeding has failed.

Another mode in which the occurrence of hemorrhage has been explained, supposes an alteration in the consistence or composition of the blood itself, which thus becomes attenuated, and capable of passing through channels or orifices that healthy blood cannot penetrate. In defence of this supposition are adduced the facts that hemorrhages are known to occur where the blood is obviously more thin, pale, and serous than common; and still more remarkably where that fluid has undergone a demonstrable change in its chemical nature, or is even visibly altered in its sensible qualities; as, for example, in certain cases of purpura and of sea-scurvy.

These hypothetical attempts to explain the processes by which hemorrhage may take place deserve, perhaps, more attention than has sometimes been paid to them. The views which they involve can scarcely be regarded as mere speculative refinements; for they often exercise a real, though perhaps an unacknowledged influence upon our practice. At any rate, if they do not, prior to experience, justify certain modes of treatment, they accord wonderfully with what experience has taught concerning the means by which hemorrhage may sometimes be stayed or prevented. In some cases we succeed by measures which tend to abate the general force of the heart and arteries and to lessen general plethora, or by diverting partial plethora and restoring the disturbed balance of the circulation, or by directly emptying the turgid capillary vessels. In other cases we rely chiefly upon expedients which we believed to have the effect of constringing the extreme vessels; styptics to the bleeding part, cold to the surface of the body, producing a sympathetic shrinking in other related membranes; or internal medicines, which use has shown to have the property of restraining the natural exhalations when in excess. And, finally, there are cases where we seek, and not in vain, to repair the blood, to restore it to its natural condition by improvements in diet, or by food of a peculiar kind, such as the juice of lemons; and *thus* the tendency to hemorrhage is cured.

Whether the hypotheses originated from a contemplation of symptoms, or whether they were suggested by the apparent effects of remedies, may be doubted; but it is well worthy of remark how in the several cases they accord with both these classes of observed facts. Certainly hemorrhage is a prominent symptom in several morbid conditions, differing greatly from each other; and there is nothing inconsistent in sometimes attempting its explanation in one way, and sometimes in another.

One observation yet remains, in regard to this doctrine of a preceding turgescence of the minute blood-vessels; namely, that it applies not only to certain kinds of hemorrhage, but also to inflammation, of which indeed it appears to be a constant and necessary element. Why, in one instance, the congestion terminates in that complex and variable process, or why, in another, it is relieved by an effusion of blood, we hitherto know not; but the fact that the same condition of capillary plethora is inceptive sometimes of the one form of disease, and sometimes of the other, supplies a rational ground for the analogy which has often been traced between hemorrhage and inflammation; and, what is of no less importance, it points out also the boundaries within which that analogy should be limited.

There is a very ancient division of hemorrhage (into active and passive) drawn, not so much from the nature of supposed proximate causes, as from the assemblage of circumstances in connection with which the efflux of blood takes place.

The distinctive characters of these two forms of hemorrhage are, in well-marked cases, sufficiently broad and decided.

Active hemorrhage occurs in persons who are young and robust, who live fully, and lead indolent lives, and are subject to the influence of those causes which tend to generate plethora. Occasionally the hemorrhage can be traced to some exciting cause, such as exposure to heat, strong mental emotion, or violent exercise. More frequently, however, it seems to be the consequence of the predisposing causes merely. It is sometimes announced by a set of symptoms expressive of what has been called the *molimen hemorrhagicum*. The patient experiences a general feeling of indisposition, with wandering and obscure pains that gradually settle in the part from which the blood is about to be discharged. A series of local symptoms, such as a sensation of weight, or of tension, or of heat and tingling, sometimes a slight degree of turgescence and redness, and a visible fulness of the larger veins, indicate the afflux of blood towards the labouring organ and the parts in its vicinity; while chilliness, paleness, and shrinking of distant parts, and especially of the feet and hands, denote an opposite state of the circulation in *them*.

The blood commonly escapes with rapidity, is of a florid colour, proceeds from a single organ, and readily coagulates, though it seldom separates distinctly into serum and crassamentum. While it is flowing, the signs of local hyperæmia diminish and disappear, warmth returns to the extremities, and the pulse regains its natural strength and frequency. The patient becomes conscious of a sensible relief, and feels stronger and more lively than before. This kind of hemorrhage is in some sort its own remedy; it ceases in virtue of the discharge of a certain quantity of blood, and it is followed by morbid consequences only when that quantity has been excessive.

Passive hemorrhage is characterized by circumstances of an exactly contrary nature. It occurs in those who are naturally feeble, or who have been debilitated by disease, fatigue, insufficient nourishment, great evacuations, or the depressing passions. It is not, in general, announced by any precursory symptoms, nor attended by any reaction. The effused blood is of a dark colour, serous, and but little disposed to coagulate; and it often is poured forth from several parts of the body at the same time. If the quantity lost be at all considerable, the natural debility of the patient is rapidly augmented; his face becomes pale, and his body loses its heat. The hemorrhage leaves him in a worse condition than that in which it found him. The flow of a certain quantity of blood is not, as in the cases of active hemorrhage, suspensive of its further effusion; frequently, indeed, passive hemorrhage resists the means opposed to it the more in proportion as it has continued longer, or been more profuse.

If every case of hemorrhage could be accurately referred to the one or the other of these forms, this distinction would be of the greatest importance and value. The truth is, however, that the majority of cases cannot be said to possess decidedly either an active or a passive character. The flow of blood is not preceded by any notable excitement or exhaustion, is not announced by any precursory symptoms, and is neither followed by any sensible improvement, nor (unless it exceed a certain limit as to quantity) by any marked debility.

May not this indefinite character of the majority of cases be accounted for by the consideration that most hemorrhages are in fact merely symptoms, and derive their character from that of the disease of which they form a part? Does it not appear that the distinction of active and passive applies chiefly to the smaller class of idiopathic hemorrhages, those that are active being allied to the active form of hyperæmia, and bearing a close analogy to inflammation, both as regards the symptoms which accompany them, the description of persons in whom they principally happen, and their remarkable tendency to recur? whilst the passive belong to that condition of the body which is attended with some morbid change in the blood; a circumstance which would of itself go far, perhaps, towards explaining their simultaneous occurrence from various organs?

However this may be, that hemorrhages are sometimes what is called active, and sometimes what is called passive, is a valuable fact, apart from all hypothesis.

And concerning these morbid effusions of blood, there are several other well-ascertained general facts, with which it imports the physician to be acquainted, but of which the limits of this work will allow of a cursory enumeration only.

In the first place, hemorrhage by exhalation, of whatever kind, takes place much more frequently and readily from some tissues of the body than from others, and most especially of all, from the mucous membranes.

Upon this important fact have arisen questions which, although not without interest in themselves, do not admit, in the present state of our knowledge, of positive solution. Has it any relation to the manner in which these membranes, and the tissues subjacent to them, are supplied with a capillary circulation? or to their laxity of attachment, which facilitates and favours the accumulation of blood therein? Again, has the density or consistence of their natural exhalations any thing to do with this disposition to hemorrhage in the mucous membranes? May we suppose that the vessels or orifices appointed to exhale mucus afford a more ready passage to the blood than those which give egress to thinner fluids—serum for example, or the cutaneous perspiration?

Hemorrhage is also liable to occur, but much more rarely, from the serous membranes; from the skin; into the cellular tissue of various parts of the body; and into the substance of the several viscera.

Another important fact in regard to these hemorrhages is, that they proceed more frequently from certain parts of the body than others, according to differences of age. Thus, in *childhood* they are most common from the membrane that lines the nasal cavities; in *youth* from the mucous membrane of the lungs and bronchi; in the *middle years* of life, and towards its decline, from the rectum, uterus, and urinary passages; and in *old age* from the blood-vessels of the brain.

There are persons (and the case is far from being an uncommon one) who are subject, during the greater part of their lives, to certain hemorrhages, which occur again and again, without any notable detriment of the general health, independently of any obvious exciting cause, and (as it would seem) from some inherent necessity of the system. Habitual hemorrhage of this kind is said to be *constitutional:* it takes place more commonly from the rectum than from any other part, although cases are recorded of its occurrence from the mucous membrane of the bladder, of the bronchi, and of the nasal cavities. Linked, in some inexplicable manner, with the original constitution of the body, this disposition to hemorrhage, as might be expected, is sometimes observed to be hereditary. It differs from ordinary hemorrhage of the active kind, by affecting, indiscriminately, those who are feeble and those who are robust, but most remarkably by its recurrence at periods more or less regular.

The celebrated Gall used strenuously to maintain the doctrine of a periodic movement in the male system analogous to that which returns monthly in the female, and marked by signs which all might observe who would take the pains to look for them. That the analogy really obtains in many points, and more distinctly in some individuals than in others, there can be no doubt. It has been incidentally noticed indeed by several writers; and Chomel has given the following clear summary of the principal features of the resemblance.

"The primary appearance of these constitutional hemorrhages is sometimes preceded by a state of general indisposition, more rarely by slight febrile disturbance, and even, acording to some observers, by a sort of chlorosis analogous to that which affects young girls in whom the menstrual evacuation is delayed or suspended. The hemorrhage sometimes recurs at precisely regular intervals, and by *monthly* periods more commonly than any other; being announced, on each occasion, by the same preludes, proceeding from the same part, continuing for the same space of time, and furnishing always about the same quantity of blood. Its accidental interruption is almost uniformly the cause or the effect of some derangement of the health. It is furthermore remarkable that these habitual hemorrhages, like the catamenia, do not ordinarily occupy the whole course of life; in most individuals they do not commence before the period of adolescence or youth, and they cease altogether, or recur at distant intervals only, in declining age. When they become excessive, they also (like hemorrhage from the uterus) enter the exclusive domain of pathology."

One of the most singular facts relating to hemorrhages is that they are, not unfrequently, vicarious or supplemental — sometimes of each other—but more often, in the female, of the menstrual discharge, between which and the constitutional hemorrhages of men there has just been shown to be some degree of analogy. Bleedings from the bladder and from the mouth sometimes follow upon the suppression of constitutional hemorrhoids; from the lungs, stomach, or rectum, upon the suspension of the menses. These hemorrhagic deviations, as they are sometimes called, take place commonly by the same organ on each occasion, sometimes by different organs in succession. It is almost always in this supplementary manner that the rarer forms of hemorrhage occur, and those of the skin in particular.

This peculiarity in regard to hemorrhage seems calculated to throw some light upon the obscure doctrine of *revulsion;* a doctrine which, though very imperfectly understood, is of continual avail in the practice of physic.

The **symptoms** which accompany internal hemorrhage are modified by various circumstances; and the degree of certainty which they impart to the diagnosis differs much in different cases.

If the part into which the blood is directly extravasated communicates with the exterior of the body, the expulsion of some of that fluid sooner or later demonstrates the case to be one of hemorrhage. The particular symptoms will have some relation to the functions of the organ that furnishes the blood, and to the time that intervenes between its extravasation and its ultimate expulsion; and certain characters will often be derived from the parts traversed by the blood before it reaches the surface. It is even difficult sometimes to determine whether the blood proceeds from a certain organ, or from those parts that lie between it and the natural outlet by which it ultimately escapes.

The blood itself will be generally more fluid and brighter in proportion as it is effused in greater quantity, and near the surface; more in clots and darker in colour, in proportion to the length of time that it has remained within the body after its escape from its proper vessels: and this length of time may depend upon the smallness of the quantity of blood effused, and the consequent tolerance of the organs through which it may have passed; or upon the actual space traversed.

If the locus of the hemorrhage does not communicate with the external air, we are without that certainty which results from the actual spectacle of the blood. But we are then assisted by *local* signs, which spring from the pressure on, or the laceration or distension of the suffering viscus, or of the parts contiguous to it; and by *general* signs, many of which are the same whether the extravasated blood reach the exterior or not. These general signs again are modified according to several circumstances. They principally vary according to the quantity of blood poured out, and to the *rapidity* of its effusion; something also will depend upon the particular organ, and much (when the quantity is the same) upon the age and strength of the patient.

Besides the symptoms which are observable at the very time of the bleeding, there are others, of much interest, which occur more remotely. These may sometimes result from a single profuse hemorrhage, but more commonly they are owing, not so much to one large bleeding, as to a repetition of such as have scarcely any immediate perceptible influence on the system.

Some of the general symptoms,—such as paleness of the face, feebleness of the pulse, coldness of the extremities, and a tendency to syncope, which have been observed to ensue upon the eruption of the blood, have been ascribed to the alarm and sense of danger which the sight of that fluid is calculated to produce in the mind of the patient. This is probably true to a certain extent; but the explanation does not apply to those cases in which the hemorrhage is strictly confined to the interior of the body, yet in which the symptoms just alluded to are often strongly marked.

For the method of **treatment** applicable to internal hemorrhages, the reader is referred to the several articles in which the different forms and varieties of hemorrhage are practically discussed. A very cursory notice only can here be taken of the general means which are found most effectual in restraining the actual efflux of the blood.

A preliminary question, however, of some importance, here presents itself. Is it in all cases of hemorrhage proper or safe to attempt to stop the bleeding?

Without going into detail, it may be stated as a rule that *constitutional* hemorrhages ought not to be interfered with, so long as they have no perceptible injurious influence upon the health, and proceed (as they mostly do) from parts of which the structure is not likely to be spoiled, nor the function impaired, by the passage of the blood. The most common seat of these constitutional hemorrhages is the rectum, to which the conditions just mentioned are, fortunately, both of them applicable. Epistaxis supplies a less frequent example of the same kind. When these habitual hemorrhages deviate from their usual channel, and are (as it were) transferred to some more important organ, it will generally be right, among other remedial measures, to endeavour to recall the original hemorrhage. It is very seldom that the metastasis takes place *for the better*, from a part where the bleeding is attended with danger, to one where it is comparatively harmless.

Again, it will seldom be proper to employ direct expedients for stanching the flow of blood in the small class of idiopathic and active hemorrhages, unless the quantity lost is so great as to endanger the safety of the patient. Such hemorrhages have commonly a tendency to cure themselves, by relieving the local or general plethora on which they depend.

Nor may we venture to use *direct* means for checking most of those hemorrhages which result from present inflammation.

With these exceptions, it will generally be right to arrest the effusion of blood as speedily as may be; though in some of the symptomatic hemorrhages this may even be of secondary importance.

To this end the patient is to be surrounded as much as possible with cool fresh air, and kept in a state of absolute quiet. All motion of the body, and emotion of the mind, all kinds of stimulating food or drink—every thing in short which has a tendency to hurry the circulation, should be diligently avoided; and that position of the body should be chosen which is the least favourable to the afflux of blood towards the part affected. The horizontal posture will be proper in hemorrhage from the bowels, the uterus, or the urinary organs. In epistaxis and in cerebral hemorrhage, the head should be raised.

Of the actual remedies used for checking the further escape of the blood, one of the most important is venesection. The objects of artificial bloodletting are, to diminish the force of the heart and arteries, to lessen general plethora, to remove local congestion, and to divert the current of the blood from the suffering organ. The method, and the amount, and the repetition of the bloodletting must of course be regulated by the circumstances of each particular case. The same objects may sometimes be effected by other modes of general depletion, and especially by the use of purgative medicines.

Next to bloodletting, astringents constitute the great resource against hemorrhage; and of these *cold* is one of the chief. It may be placed in direct contact with the bleeding surface, as when ice is swallowed to restrain hæmatemesis; or cold water injected into the rectum in hemorrhoids, or into the vagina in flooding from the uterus; or it may be applied to the surface of the body, as near as possible to the seat of the hemorrhage, as to the nose and forehead in epistaxis; to the epigastrium in hemorrhage from the stomach; to the lower part of the abdomen, or to the perineum, in hemorrhage from the intestines, uterus, or urinary organs. But the influence of cold in constringing the smaller vessels is not confined to the part with which it is in contact: it will stop hemorrhage by the sympathetic shrinking which it produces in distant parts. Epistaxis, for example, has often been arrested by the sudden apposition of cold water to the neck, back, or genital organs. Of its even mischievous power in this way we have continual illustration in the suppression of the catamenia by cold applied to the feet.

There is a long catalogue of medicinal substances, which are esteemed to possess more or less of a specific virtue, when taken internally, in arresting the flow of blood. Most of these are of an astringent nature, and some of them are essentially useful. The binacetate of lead enjoys in this country a higher character perhaps than any other of these substances.

Many vegetable matters, and some artificial compounds, frequently employed in internal hemorrhages, seem to owe their astringent and styptic properties to the gallic acid [and the tannic acid] which enters into their composition. Such are the rhatany root, uva ursi, bistort, tormentil, the pomegranate, kino, catechu, the several preparations of gall-nuts, [oak bark, monesia, &c.] and the nostrum called Ruspini's styptic [creasote].

The power of arresting internal hemorrhage has also been confidently ascribed by different persons to nitre given in large doses, to the mineral acids, to the muriated tincture of iron, to alum, to the oil of turpentine, [See Astringents,] to the secale cornutum, and to various other substances; a more particular account of which may be found in other parts of this work, under the head of the individual hemorrhages.

Thomas Watson.

HEMORRHOIDS, *hæmorrhois.*—The term hemorrhoids, from the Greek, *αιμα*, *sanguis*, and *ρεω*, *fluo*, signifying simply a blood-flux, is not adapted to convey any correct idea of the nature of the various affections to be treated of under this head, some of which are not even attended with a discharge of blood.

Custom, however, has sanctioned and established its use in a particular sense, viz. as synonymous with piles, and to custom we think it right to conform, it being our duty to furnish practical information rather than to enter into an etymological disquisition.

The meaning of the word hemorrhoids is now, by common consent, so entirely limited to certain affections of the rectum that no inconvenience can arise from its adoption. But this has not been the case always, for we find that very many authors, modern as well as ancient, have employed it in its literal sense, and under the epithet hemorrhoids have described discharges of blood from the bladder, the uterus, and other organs, as well as from the rectum. Among others, Celsus, in treating hemorrhoids, says—"Idque (vitium) etiam in ore vulvæ fœminarum incidere consuevit." (Lib. vi. cap. xviii.)

Notwithstanding this and the many other exceptions alluded to, the majority of authors, beginning with Hippocrates, have restricted the meaning of hemorrhoids to those diseases of the rectum which form the subject of the present article.

By hemorrhoids, then, are to be understood, first, a flux of blood from the rectum without any tumours internal or external; secondly, a flux of blood from the rectum with internal or external tumours; thirdly, tumours internal or external without flux of blood. The distinctive characters of these tumours and of the blood-flux will be described hereafter.

When it is remembered how very common hemorrhoidal affections are, how great the sufferings they occasion, and how frequently they fall under our observation and treatment, we naturally conclude that every particular relating to them has been fully investigated and satisfactorily made out; yet the reverse is the fact; and, innumerable as are the dissertations and other publications on hemorrhoids, we have sought in vain for acccurate information of their anatomical characters and pathology; nor have we been able to find it in the museums of morbid anatomy of this metropolis preparations illustrative of the various kinds of hemorrhoids.

The deficiency of information on this subject may in part be ascribed to the few deaths which occur absolutely from hemorrhoids; for, excepting the cases which prove fatal after an operation, the individuals affected with hemorrhoids die usually of some other complaint, which, being urgent and prominent, while perhaps the hemorrhoids have ceased to be troublesome, engrosses the attention during life and at the post-mortem examination. That this is the case at our large hospitals, all who are in the habit of witnessing the post-mortem examinations will acknowledge, the condition of the rectum seldom forming a part of the investigations; an omission not to be ascribed to negligence, but arising from the attention not having been attracted to this organ during the latter part of the patient's life.

1. *State of the rectum.*—The anatomical characters of the rectum, which we have discovered by dissection, independent of the hemorrhoidal tumours, are an enlargement of the hemorrhoidal veins and hypertrophy of the submucous tissue. The enlarged veins are seen through and lying immediately under the mucous membrane, taking a perpendicular course almost parallel to each other for seven or eight inches, their trunks being as large as a crow-quill, and formed from innumerable small arborescent veins at the anal extremity of the rectum, which render the bowel intensely vascular. The same vascularity and lesion of these veins have been described by Dr. Colles; (Dublin Hospital Reports, vol. v. p. 152,) and Morgagni mentions an instance of extraordinary enlargement of the hemorrhoidal vein, "interna hæmorrhoidalis vena sub coli intestini fine et tota recti longitudine *pollicis* fere crassitiem æquaret." (De Sedibus et Causis Morborum, lib. iii. p. 38.)

2. *Anatomical characters of the hemorrhoidal tumours.*—These tumours are generally regarded as arising from a varicose state of the hemorrhoidal veins: "hæmorrhoides autem nihil aliud esse quàm varices venarum ani." (*Morgagni*, De Sedibus et Causis, lib. iii. p. 38.) By Sir Astley Cooper they are described as being found in two states; "a varicose enlargement of a vein; or an excrescence arising from its adhesion and organization," a description not very intelligible. (Lectures, by Tyrrell, vol. ii. p. 335.) By others they are distinguished into such as discharge blood, *bleeding piles*: and into such as are not attended with hemorrhage, *blind piles*: "hemorrhoidum verò aliæ sunt cæcæ, aliæ apertæ: cæcæ sunt quæ omni tempore inflatæ sunt, et nihil excernunt: apertæ verò sunt quæ per tempora sanguinem effundunt." (Aetii Tetr. Sermo ii. cap. v.) By Sauvages it is proposed to call the bleeding tumours, hæmorrhois; and the blind, mariscæ; "tumores illi (sine ullo sanguinis effluxu) *mariscæ* vocari debent, et fluxus cruoris, *hæmorrhois* multò aptius vocatur." (Nosologia Methodica, vol. ii. p. 323.)

Such are the notions usually entertained of these tumours, notions which give us very little insight into their exact nature, seeing, as we shall presently do, that they differ so materially in their structure as to justify the division of them into the several following kinds.

The first kind (which may be called *varicose*) is that which arises from a varicose state of the hemorrhoidal veins, or from the accidental dilatation of a small vein at a particular point, by which a cyst distended with venous blood is formed without rupture of the coats of the vessel, and is covered only by the mucous membrane of the bowel; a manner of formation which appears to have struck Celsus, who describes hemorrhoids as "ora venarum tanquam ex capitalibus quibus sergentia quæ sæpe sanguinem effundunt." (Lib. vi. cap. xviii.)

These tumours form within the gut, and are eventually extruded from causes hereafter to be described. They may be recognised when external, as consisting of a rounded tense elastic nucleus, the size of a pea, covered by the intestinal mucous membrane which moves easily upon it, and may be pinched up separately, its adhesion to the distended or varicose vein, the nucleus, being by the submucous cellular tissue in its natural state of tenuity. Should this tumour remain extruded, the blood in the distended or varicose vein, being as it were out of the circulation, coagulates, thus converting the nucleus into a solid clot, still covered by the original mucous membrane of the rectum, which after exposure becomes transformed more or less perfectly into skin. This coagulum sometimes becomes organized, and the exterior covering strongly adherent from attacks of inflammation, in consequence of which the whole tumour is rendered solid and vascular. These tumours constitute one variety of bleeding piles.

The second kind of hemorrhoidal tumours, which may be be called *erectile*, present all the characters of an erectile tissue: they are cellular, spongy, full of blood, intensely vascular, and bleed profusely from innumerable points on their surface; a fine example of which is furnished by Sir James Earle, in the case of a young lady, in whom "the tumour was about nine inches in circumference, separable into several lobes, and altogether like a piece of sponge, bleeding from every pore. It was, however, of a healthy appearance, soft, and compressible." (Observations on Hæmorrhoidal Excrescences, p. 23.)

The vascular character of this kind of tumour has been ascertained by dissection. "I had an opportunity," says Dr. Colles, "of examining the structure of these tumours in a patient who died of another disease. On slitting up the rectum I saw three bloodvessels, each as large as a crow-quill, running for some way down the intestine, and then dividing into a number of branches; these vessels ramified very profusely, and each seemed by interweaving of its branches to form one of these tumours. The trunks and branches were covered only by the lining membrane of the intestine." (Dublin Hospital Reports, vol. i. p. 152.) The supply of blood to these tumours is not therefore by one large trunk, but by numerous minute vessels. Tumours of this description commence within the gut, afterwards descend; and they constitute another variety of bleeding piles.

The third kind of hemorrhoidal tumours consist wholly of dense, thickened, or hypertrophied cellular tissue covered by the intestinal mucous membrane, and are from their earliest formation *external*. At their origin each is merely a small fold of mucous membrane, which with its submucous tissue has been forced through the anus by efforts at the closet or other causes, and being pinched by the contraction of the sphincter is prevented from returning within the bowel. Exposed thus to friction and other sources of irritation, these tumours are liable to inflammation and consequent thickening and induration of the submucous tissue above described; while the mucous membrane continuing to be exposed gradually changes its character, is transformed into skin, and its organic sensibility being in this manner diminished, the whole tumour becomes a chronic pile more or less flaccid and insensible until inflammation is again excited in it, when it tumefies, grows red, hard, and extremely painful, but does not bleed. By continued irritation from friction and want of cleanliness, these tumours often increase to a large size, become excessively indurated, and assume, from the pressure of the nates, a flattened oblong form with a thick rounded irregular edge; and from the same causes the opposing surfaces of these piles become abraded, ulcerated; and fissures and rhagades are produced from which a thin purulent discharge takes place. Tumours of this description constitute the *mariscæ* or blind piles.

All the kinds of hemorrhoidal tumours above described vary much in form and colour. When inflamed or highly congested they will be red or purple, and tense and hard; and when in an indolent condition they will be more or less pale and flaccid. Generally they have a broad base: sometimes they are pedunculated.

The hemorrhoidal flux.—Nothing is more various than this hemorrhage, either as relates to quantity or to the circumstances under which it takes place. The most simple form occurs without any sign or premonition, without hemorrhoidal tumour, without lesion of any kind, if we except a determination of blood to the rectum; and here the hemorrhage, it may reasonably be conjectured, is the product of a vital exhalation from the capillaries of the mucous membrane. Several ounces of pure red blood may be lost at the closet from the rectum, the patient having experienced no uneasiness, no pain either previous or subsequent to the discharge, and without previous or subsequent hemorrhage; or patients subject to bleeding piles at intervals of a week, a month, or longer, may lose blood unconsciously, and in place of stool, to the amount sometimes of half a pint.

On some occasions the hemorrhage will recur so frequently and in such quantity as to induce an alarming debility and anæmia, without any attendant local symptoms; while at other times the excessive discharge will be accompanied with signs of internal hemorrhoids and of great determination of blood to the bowel. It may occur in quantities to endanger life from external tumours of the erectile kind, as happened in the example quoted from Sir James Earle's Observations: or the hemorrhage may be small in quantity, not exceeding a tea or table-spoonful, taking place after every dejection and for many days, then ceasing, and returning at uncertain and rather distant periods, attended always with internal or external hemorrhoidal tumours: or the hemorrhage may assume a periodical character, more or less irregular nevertheless, but occurring once in six or seven weeks, or in three or four months, preceded by an abdominal congestion, which is immediately relieved by the discharge. Very many persons who live freely are liable to this kind of flux, a happy resource of nature to unload the system when too plethoric, and so to preserve their health. Experience teaches them that this periodical loss of blood, when not too copious, is beneficial, and they regard its return with satisfaction. If this accustomed discharge ceases, a determination of blood to another organ will ensue, and apoplexy, diseased liver, or some other very serious organic affection be the result. There are instances in which the hemorrhoidal flux will go on without the individual being aware of its extent or of its effects on the system, the loss not being great at any one time, but continuing day after day and week after week, until it exhausts the strength, blanches the face, and, if he is advanced in years, brings about debility under which he sinks, or from which he recovers slowly and with difficulty.

The source of the hemorrhoidal flux is unquestionably various; yet it is the prevailing opinion that it issues from a rupture or bursting of the varicose hemorrhoidal veins. That this opinion is well founded, and that the varicose or dilated veins are the true source of the blood in the majority of cases, there can, we think, be little doubt. The facts that the hemorrhage occurs very frequently in a stream, while the patient is straining at the closet, the stream being interrupted as the straining is suspended, and returning as the efforts are repeated, form strong presumptive evidence, consistent with the anatomical peculiarities of these veins. It has been stated that the hemorrhoidal veins take a perpendicular course from the anus up the rectum, and as they, like nearly all the veins of the portal system, are not provided with valves, hemorrhage from a rupture of one of these veins when varicose or dilated, in a stream interrupted, as the efforts at the closest are continued or suspended, is probable and intelligible; and it may take place to a prodigious amount.

Another source of the hemorrhoidal flux is from the capillaries of the rectum by vital exhalation or exudation, in cases of determination of blood to the mucous lining, a form of hemorrhage similar in every respect to that which is known to proceed from the mucous membrane of the small intestines in hepatic obstructions.

A third source is by exudation from the surface of the erectile tumours, internal or external, where the blood may be seen to issue from every pore, as stated by Sir James Earle in the case already quoted.

A fourth source of hemorrhage may be laceration of the congested mucous membrane by hard scybala forced through the sphincter by great effort, the body being much constipated. Here the hemorrhage is exceedingly trifling, and attended with pain, such as might be supposed to occur under the circumstances related.

The **Diagnosis** of the hemorrhoidal flux has been explicitly pointed out by Actuarius; "Verum ille (sanguis) qui ab altioribus locis emanat et aliquamdiu in corpore est moratus, nigrior est: hic vero purus, sincerus, et qualis ex jam cœcis hostiis profluit." (Med. sive de Meth. Med. lib. i. cap. 20.) The blood from piles is fluid and florid, may be discharged before or after a dejection, may cover, but is never mixed with the fæces; whereas hemorrhage from the intestines higher up is manifest by the blood being black and coagulated. Where the hemorrhage arises from dysentery, it is mixed with mucus, which gives it the characteristic appearance of portions of flesh; and where it is produced by various kinds of ulceration, it is confounded with the fæces.

The **Causes** of hemorrhoids are hereditary predisposition, habitual constipation, free living, obesity, a sedentary mode of life, and aloetic and other irritating purgatives. Hereditary pre-disposition to hemorrhoids is marked in many persons, but of all the causes which operate in the production of piles, habitual constipation is the most frequent. By habitual constipation the residual alimentary matter is delayed in the colon, becomes hard and knotty, and a source of great irritation to the large intestines, particularly to the rectum. This irritation induces a determination of blood to the lower bowel, this again congestion and gradual dilatation and varicose lesion of the hemorrhoidal veins, which eventually form tumours, burst or rupture, and give rise to hemorrhage; consequences all favoured by the anatomical peculiarities of the portal system, and accelerated by the efforts at the closet:—thus are bleeding piles formed. Habitual constipation is perhaps also the only cause of the blind piles or mariscæ. When the bowels are costive, the sphincter is always tight and rigid, so that by its contraction the protruded membrane is prevented from returning, and being in some degree strangulated and exposed to irritation from friction, it inflames, indurates, and constitutes piles which do not bleed.

By free living as a cause of homorrhage, we do not mean gluttony and drunkenness merely, but also that generous system of diet and indulgence at the table which prevails throughout society. The habitual liberal use of fermented liquors and of animal food produces a plethoric state not only of the whole system, but especially of the abdominal viscera concerned in digestion, the veins of which viscera constitute the portal system, and concur to form the vena portæ itself. A fulness of the portal system, unprovided as it is with valves, must necessarily determine a congestion of the hemorrhoidal veins; and congestion of these veins from any cause will, as we have seen, produce the hemorrhoidal flux and tumors. It is in persons who have hemorrhoids from living freely, that we have observed the flux to be most regular and periodical, and most decidedly salutary; and there can be no doubt that it proves a great preventive of visceral disease, to which these persons would otherwise be very liable. The suppression of the periodical flux is always attended with inconvenience.

A sedentary mode of life tends to produce hemorrhoids, by favouring a sluggish circulation in the portal system, which leads to hemorrhoidal congestion and its consequences: the pressure accruing from obesity leads to the same results.

Symptoms.—The symptoms are such as arise from the determination of blood to the rectum and congestion of blood in the hemorrhoidal vessels, and such as arise from the tumours whether indolent or in a state of irritation and inflammation.

The hemorrhoidal flux is not always rendered cognizable by symptoms, examples of which have been already mentioned. On the other hand, the determination of blood to the rectum, which precedes the hemorrhage, will be marked by dull pain about the back and loins, a sense of weight and heat about the sacrum and rectum, scanty and high-coloured urine, heaviness of the head, and disturbance of the digestive functions; signs which persist for several days, when the flux supervenes and entirely relieves the patient. These symptoms are most manifest where the flux is periodical. In those who have hemorrhoids from habitual constipation, there will be weight and heat, and a sense of fulness about the rectum very constantly, an obscure tenesmus, frequent micturition from sympathetic irritation of the bladder, and leucorrhœa, from a similar irritation of the vagina and uterus; all of which are temporarily alleviated by the discharge of blood, but are never entirely removed, the cause remaining.

The symptoms arising from the henorrhoidal tumours are those of irritation and inflammation. Tumours situated without the sphincter are perpetually irritated by the friction of the parts in the ordinary motion and erect position of the body, and moreover they are irritated to a painful degree during the period of the evacuation of the bowels. The irritation is much aggravated by want of cleanliness, and soothed by regular ablution. Many persons affected by hemorrhoidal tumours experience pain from sitting, aggravated to a great degree when they travel in a carriage or take horse exercise. The irritation will frequently produce accessions of inflammation, in which the tumours will become congested, swollen, red or purple, and excessively painful, so as to oblige the patient to keep his bed for many days.

The **Treatment** of hemorrhoids must be considered in reference to the flux and to the tumours.

In considering the treatment of bleeding piles, the first step should be an inquiry into the influence of the flux on the health; next into the cause and the practicability of removing it.

If the cause of hemorrhoids is free living, and the flux salutary, and if the individual subject to the flux will persist in his mode of life, it would be unwise to interfere. It is only in the event of the flux being profuse that means to restrain it should be contemplated. It may happen, however, that a person subject to a salutary periodical flux may be so harrassed by hemorrhoidal tumours as to render their extirpation unavoidable; and should their removal suppress the flux, either the patient must change his habits to those of great temperance, or must lose blood from time to time by an artificial outlet in order to guard against disease; for pathological congestions will otherwise most assuredly occur. It was proposed by the older writers to leave one pile as a safety-valve; "Quare quùm plures sint hæmorrhoides unam relinquere oportet, purgationis gratia," (Pauli Æginatæ de Re Medica, lib. iii. cap. lix.) a suggestion not to be altogether slighted. The hemorrhage, however, may proceed within the bowel, and, therefore, not be suppressed by the removal of the outward tumours, in which case there can be no hesitation in deciding upon the operation.

In all persons affected with hemorrhoids, except those above mentioned who are sensible of deriving benefit from the flux, there is an anxiety to be free from the hemorrhage and from the tumours; and if sufficient attention is given to the various causes operating in the production of the flux and tumours, there can be no reason why measures to restrain the one and remove the other should not be put in practice. The influence of habitual constipation in the production, aggravation and continuance of hemorrhoids, should never be overlooked; the obviating this cause by regulating the bowels by suitable aperients, will frequently cure the patient either of the bleeding or of the blind piles; and the restoration of the natural action of the bowels is certainly essential to prevent a recurrence of the hemorrhoids, however effectually they have been suppressed by medicine or removed by operation.

In the treatment of hemorrhoids of all descriptions, the regulating the bowels by suitable aperients is a most essential point: all irritating and drastic purgatives, as aloes and colocynth, are inadmissible, our choice must be directed to those which act efficiently but mildly and without irritation of the lower bowel. Of these, senna, sulphur, castor-oil, and the neutral salts are the most eligible, and should be prescribed in doses adapted to the constitution of the patient. The confection of senna combined with sulphur and magnesia, is in general use, and is perhaps the most desirable form of aperient that can be employed. A point of immense consequence to be insisted on is that the aperient should be so administered as to act upon the bowels in the evening.

Persons afflicted with hemorrhoids will be distressed through the day if their bowels are acted upon in the morning, because of the erect position which they are obliged to sustain in their ordinary avocations, all which distress is obviated if their bowels are not evacuated till the evening, the horizontal position of the night removing all inconvenience, and allowing the day to be passed in comparative comfort. Again, the seat of the closet being inclined instead of horizontal is a means of rendering the exoneration of the bowels less painful; and where prolapsus of the gut co-exists with piles, the observance of the horizontal position during the action of the bowels, is a great preventive of suffering as it is a great aid in the cure.

Injections of warm water and other ingredients daily administered with a view to regulate the bowels and to relieve hemorrhoids, are very objectionable; they give a momentary relief, but they aggravate the symptoms they are intended to remove. An injection of half-a-pint of cold water daily has, however, been found highly serviceable. In order to restrain the hemorrhage where it is profuse or its continuance is injurious, we can confidently recommend turpentine, half-a-drachm of which may be mixed with yolk of egg, or given in a table-spoonful of gruel once or twice a day. The hemorrhage is often effectually arrested by the first dose; and where the body is already exsangueous, and the discharges of blood are frequent and great, the turpentine is an invaluable remedy.

We have been informed by a patient who suffered and was seriously debilitated from bleeding piles, that, after having tried almost every other remedy, the copaiba was successfully administered, and at once and permanently cured the hemorrhage. And although our own experience does not furnish us with facts in favour of the secale cornutum, we have every reason to believe from the testimony of others and from the influence which the secale exerts on hemorrhage from the womb, that it would prove a very efficacious remedy in the hemorrhoidal flux. It may be administered in the dose of ten grains twice or thrice a day, in the form of decoction or infusion.

[When the hemorrhage becomes dangerous from quantity, the most efficacious of the mineral and vegetable astringents may be prescribed,—care being taken that they are not used of such strength from certain parts of the body than others, according to differences of age. Thus, in *childhood* they are most common from the membrane that lines the nasal cavities; in *youth* from the mucous membrane of the lungs and bronchi; in the *middle years* of life, and towards its decline, from the rectum, uterus, and urinary passages; and in *old age* from the blood-vessels of the brain.

There are persons (and the case is far from being an uncommon one) who are subject, during the greater part of their lives, to certain hemorrhages, which occur again and again, without any notable detriment of the general health, independently of any obvious exciting cause, and (as it would seem) from some inherent necessity of the system. Habitual hemorrhage of this kind is said to be *constitutional:* it takes place more commonly from the rectum than from any other part, although cases are recorded of its occurrence from the mucous membrane of the bladder, of the bronchi, and of the nasal cavities. Linked, in some inexplicable manner, with the original constitution of the body, this disposition to hemorrhage, as might be expected, is sometimes observed to be hereditary. It differs from ordinary hemorrhage of the active kind, by affecting, indiscriminately, those who are feeble and those who are robust, but most remarkably by its recurrence at periods more or less regular.

The celebrated Gall used strenuously to maintain the doctrine of a periodic movement in the male system analogous to that which returns monthly in the female, and marked by signs which all might observe who would take the pains to look for them. That the analogy really obtains in many points, and more distinctly in some individuals than in others, there can be no doubt. It has been incidentally noticed indeed by several writers; and Chomel has given the following clear summary of the principal features of the resemblance.

"The primary appearance of these constitutional hemorrhages is sometimes preceded by a state of general indisposition, more rarely by slight febrile disturbance, and even, acording to some observers, by a sort of chlorosis analogous to that which affects young girls in whom the menstrual evacuation is delayed or suspended. The hemorrhage sometimes recurs at precisely regular intervals, and by *monthly* periods more commonly than any other; being announced, on each occasion, by the same preludes, proceeding from the same part, continuing for the same space of time, and furnishing always about the same quantity of blood. Its accidental interruption is almost uniformly the cause or the effect of some derangement of the health. It is furthermore remarkable that these habitual hemorrhages, like the catamenia, do not ordinarily occupy the whole course of life; in most individuals they do not commence before the period of adolescence or youth, and they cease altogether, or recur at distant intervals only, in declining age. When they become excessive, they also (like hemorrhage from the uterus) enter the exclusive domain of pathology."

One of the most singular facts relating to hemorrhages is that they are, not unfrequently, vicarious or supplemental—sometimes of each other—but more often, in the female, of the menstrual discharge, between which and the constitutional hemorrhages of men there has just been shown to be some degree of analogy. Bleedings from the bladder and from the mouth sometimes follow upon the suppression of constitutional hemorrhoids; from the lungs, stomach, or rectum, upon the suspension of the menses. These hemorrhagic deviations, as they are sometimes called, take place commonly by the same organ on each occasion, sometimes by different organs in succession. It is almost always in this supplementary manner that the rarer forms of hemorrhage occur, and those of the skin in particular.

This peculiarity in regard to hemorrhage seems calculated to throw some light upon the obscure doctrine of *revulsion;* a doctrine which, though very imperfectly understood, is of continual avail in the practice of physic.

The **symptoms** which accompany internal hemorrhage are modified by various circumstances; and the degree of certainty which they impart to the diagnosis differs much in different cases.

If the part into which the blood is directly extravasated communicates with the exterior of the body, the expulsion of some of that fluid sooner or later demonstrates the case to be one of hemorrhage. The particular symptoms will have some relation to the functions of the organ that furnishes the blood, and to the time that intervenes between its extravasation and its ultimate expulsion; and certain characters will often be derived from the parts traversed by the blood before it reaches the surface. It is even difficult sometimes to determine whether the blood proceeds from a certain organ, or from those parts that lie between it and the natural outlet by which it ultimately escapes.

The blood itself will be generally more fluid and brighter in proportion as it is effused in greater quantity, and near the surface; more in clots and darker in colour, in proportion to the length of time that it has remained within the body after its escape from its proper vessels: and this length of time may depend upon the smallness of the quantity of blood effused, and the consequent tolerance of the organs through which it may have passed; or upon the actual space traversed.

If the locus of the hemorrhage does not communicate with the external air, we are without that certainty which results from the actual spectacle of the blood. But we are then assisted by *local* signs, which spring from the pressure on, or the laceration or distension of the suffering viscus, or of the parts contiguous to it; and by *general* signs, many of which are the same whether the extravasated blood reach the exterior or not. These general signs again are modified according to several circumstances. They principally vary according to the quantity of blood poured out, and to the *rapidity* of its effusion; something also will depend upon the particular organ, and much (when the quantity is the same) upon the age and strength of the patient.

Besides the symptoms which are observable at the very time of the bleeding, there are others, of much interest, which occur more remotely. These may sometimes result from a single profuse hemorrhage, but more commonly they are owing, not so much to one large bleeding, as to a repetition of such as have scarcely any immediate perceptible influence on the system.

Some of the general symptoms,—such as paleness of the face, feebleness of the pulse, coldness of the extremities, and a tendency to syncope, which have been observed to ensue upon the eruption of the blood, have been ascribed to the alarm and sense of danger which the sight of that fluid is calculated to produce in the mind of the patient. This is probably true to a certain extent; but the explanation does not apply to those cases in which the hemorrhage is strictly confined to the interior of the body, yet in which the symptoms just alluded to are often strongly marked.

For the method of **treatment** applicable to internal hemorrhages, the reader is referred to the several articles in which the different forms and varieties of hemorrhage are practically discussed. A very cursory notice only can here be taken of the general means which are found most effectual in restraining the actual efflux of the blood.

A preliminary question, however, of some importance, here presents itself. Is it in all cases of hemorrhage proper or safe to attempt to stop the bleeding?

Without going into detail, it may be stated as a rule that *constitutional* hemorrhages ought not to be interfered with, so long as they have no perceptible injurious influence upon the health, and proceed (as they mostly do) from parts of which the structure is not likely to be spoiled, nor the function impaired, by the passage of the blood. The most common seat of these constitutional hemorrhages is the rectum, to which the conditions just mentioned are, fortunately, both of them applicable. Epistaxis supplies a less frequent example of the same kind. When these habitual hemorrhages deviate from their usual channel, and are (as it were) transferred to some more important organ, it will generally be right, among other remedial measures, to endeavour to recall the original hemorrhage. It is very seldom that the metastasis takes place *for the better*, from a part where the bleeding is attended with danger, to one where it is comparatively harmless.

Again, it will seldom be proper to employ direct expedients for stanching the flow of blood in the small class of idiopathic and active hemorrhages, unless the quantity lost is so great as to endanger the safety of the patient. Such hemorrhages have commonly a tendency to cure themselves, by relieving the local or general plethora on which they depend.

Nor may we venture to use *direct* means for checking most of those hemorrhages which result from present inflammation.

With these exceptions, it will generally be right to arrest the effusion of blood as speedily as may be; though in some of the symptomatic hemorrhages this may even be of secondary importance.

To this end the patient is to be surrounded as much as possible with cool fresh air, and kept in a state of absolute quiet. All motion of the body, and emotion of the mind, all kinds of stimulating food or drink—every thing in short which has a tendency to hurry the circulation, should be diligently avoided; and that position of the body should be chosen which is the least favourable to the afflux of blood towards the part affected. The horizontal posture will be proper in hemorrhage from the bowels, the uterus, or the urinary organs. In epistaxis and in cerebral hemorrhage, the head should be raised.

Of the actual remedies used for checking the further escape of the blood, one of the most important is venesection. The objects of artificial bloodletting are, to diminish the force of the heart and arteries, to lessen general plethora, to remove local congestion, and to divert the current of the blood from the suffering organ. The method, and the amount, and the repetition of the bloodletting must of course be regulated by the circumstances of each particular case. The same objects may sometimes be effected by other modes of general depletion, and especially by the use of purgative medicines.

Next to bloodletting, astringents constitute the great resource against hemorrhage; and of these *cold* is one of the chief. It may be placed in direct contact with the bleeding surface, as when ice is swallowed to restrain hæmatemesis; or cold water injected into the rectum in hemorrhoids, or into the vagina in flooding from the uterus; or it may be applied to the surface of the body, as near as possible to the seat of the hemorrhage, as to the nose and forehead in epistaxis; to the epigastrium in hemorrhage from the stomach; to the lower part of the abdomen, or to the perineum, in hemorrhage from the intestines, uterus, or urinary organs. But the influence of cold in constringing the smaller vessels is not confined to the part with which it is in contact: it will stop hemorrhage by the sympathetic shrinking which it produces in distant parts. Epistaxis, for example, has often been arrested by the sudden apposition of cold water to the neck, back, or genital organs. Of its even mischievous power in this way we have continual illustration in the suppression of the catamenia by cold applied to the feet.

There is a long catalogue of medicinal substances, which are esteemed to possess more or less of a specific virtue, when taken internally, in arresting the flow of blood. Most of these are of an astringent nature, and some of them are essentially useful. The binacetate of lead enjoys in this country a higher character perhaps than any other of these substances.

Many vegetable matters, and some artificial compounds, frequently employed in internal hemorrhages, seem to owe their astringent and styptic properties to the gallic acid [and the tannic acid] which enters into their composition. Such are the rhatany root, uva ursi, bistort, tormentil, the pomegranate, kino, catechu, the several preparations of gall-nuts, [oak bark, monesia, &c.] and the nostrum called Ruspini's styptic [creasote].

The power of arresting internal hemorrhage has also been confidently ascribed by different persons to nitre given in large doses, to the mineral acids, to the muriated tincture of iron, to alum, to the oil of turpentine, [See ASTRINGENTS,] to the secale cornutum, and to various other substances; a more particular account of which may be found in other parts of this work, under the head of the individual hemorrhages.

THOMAS WATSON.

pregnancy; but they are never observed in the offspring of those who have not, either one or both, more commonly both, previously laboured under it.

These two diseases and tubercles, which have been discovered in the lungs of still-born infants, furnish perhaps the only examples of direct hereditary transmission. Other diseases, for instance deafness and blindness, are connate, and are frequently observed to occur in members of the same family; but these individuals will generally be found to have sprung from parents who did not labour under the same privation. It is true that persons born deaf or blind rarely marry, so that much opportunity is not afforded of observing how far this family peculiarity, however acquired, is transmissible: but the same fact may be adduced as an argument that it is not received by inheritance. Of one hundred and forty-eight scholars at one time on the foundation of the Deaf and Dumb Institution in London, one was of a family in which there were five deaf and dumb; one in which there were four; eleven in which there were three; and nineteen in which there were two. Of the scholars, fifty-seven were girls, and the rest boys; and none of them were the children of deaf and dumb parents. The gentleman who superintended the manufactories, and who consequently had the best opportunity of tracing the subsequent history of his scholars, stated that some of them were married and had children, all of whom were perfect in the organ of hearing. One instance occurred in which both parents had been born deaf, yet the children possessed the faculty of hearing. (A Treatise on the supposed hereditary properties of Diseases, by Joseph Adams, M. D. &c. p. 66.)

Cataract is frequently observed as a congenital disease in members of the same family; but in this case it is found not to appear in successive generations as if it were at once connate and hereditary. Hydrocephalus, too, is connate, and members of the same family are born with it; but being in the adult a rapidly fatal disease, it cannot of course be received by inheritance.

Though nature is thus sparing of the direct transmission of disease from parents to offspring, she is not equally so of morbid tendencies; and what are commonly called hereditary diseases are so merely by predisposition. That children inherit the outward bodily configuration and manifest peculiarities of one or other of their parents, is well known; and that they likewise derive from them that more hidden weakness of certain organs by which these are prone to take on diseased action, is proved by the experience of ages. The hereditary predisposition to scrofula, consumption, gout, and insanity, is so essentially a part of the medical creed, that a professional man called to a case supposed to belong to any of these disorders immediately endeavours to strengthen his diagnosis by information gathered from the family history. But besides these very common examples, various other diseases, such as asthma, angina pectoris, a general hemorrhagic disposition, apoplexy, epilepsy, and various nervous disorders, blindness and deafness, not congenital, and, according to Dr. Adams, elephantiasis, are transmitted in predisposition from generation to generation. To this sufficiently formidable list, some persons are disposed to add goître and cretinism, though this can be regarded as a mere speculative opinion; but an affection closely allied to the latter, idiocy, is unquestionably hereditary. Of this Haller presents us striking examples in two noble families, into which it had been introduced above a century before the time he wrote, and where it was still manifesting itself in some individuals of the fourth and fifth generations. Certain idiosyncrasies too, which, like idiocy, cannot be regarded as diseases, are observable in successive generations of the same family; for instance, a peculiar susceptibility to the effect of certain remedies, such as mercury and opium.

Of transmissible diseases, some have appeared in several individuals at a certain period of life, and such members of the family as have escaped at this critical period have remained exempt from the affection. All the members of the family of the Le Comptes saw clearly till about the age of sixteen or eighteen; at that age some of them, without any apparent cause, became dim-sighted, and grew gradually more so till total blindness ensued: such has been the case for three generations with a certain number in each race; but such as have escaped at that critical age have retained their sight through life. (Baltimore Med. and Phys. Reg. 1809.) In the family of Mr. Bass, at Peterborough, deafness has observed a similar course. (*Adams*, ubi suprà, p. 19.) Hydrocephalus, the disposition to which exists in certain familes, though it cannot be regarded as an hereditary disease, has often attacked individuals of the same race at the same age; and those who have then escaped have continued free from the complaint. The same observation has been made of elephantiasis, angina pectoris, and other diseases.

Like other family peculiarities, hereditary predisposition to disease may cease in one generation to appear in a subsequent one; or, though manifesting itself in each generation, it may pass to the subsequent one through an individual who has escaped it. Of this mode of transmission an extraordinary example occurs in the relation of cases of hereditary hemorrhage by Dr. Riecken. (Medicinische-Chirurgische Zeitung, Nov. 1830, and Edinburgh Med. and Surg. Journal, No. 108.) These cases occurred in the principality of Birkenfield in Oldenburg. The parents had never been subject to hemorrhage, and the father, Ernest P., was living in good health in his eighty-sixth year at the time of the publication of the narrative. The couple had twelve children, five sons and seven daughters, of whom three boys and one girl died of hemorrhage. Their youngest daughter, who never suffered from the disease, married a stout healthy man and had six children, four boys and two girls, of whom three boys died of hemorrhage. There is no trace of any member of the family, either on the male or female side, anterior to the children of Ernest P., being affected with the disease.

How the hemorrhagic disposition arose in the second generation of Ernest P.'s family we know not; but in certain cases the first appearance of an hereditary disease in an individual can be traced to an assignable cause. The natives of the warmer regions of the earth become affected in colder latitudes with scrofula and consumption; and the latter disease manifests itself under such circumstances even in inferior animals, as in the monkey tribe. Certain modes of living engender gout; and elephantiasis appears to be produced by a peculiar climatorial influence.

It has never been observed that these diseases, when introduced by manifest causes, have not partaken of the property of transmission to succeeding generations. If they do indeed possess this property, (and there seems no reason at present to doubt it,) nature would appear to have instituted laws for the transmission of disease on two points, the opposite of those established regarding hereditary varieties in manifest structure. The laws in the latter case are, as illustrated in Dr. Prichard's very elaborate and ingenious work, that connate varieties are apt to appear in the progeny; but that changes produced by external causes terminate with the individual, and have no influence on his descendants. (Researches into the Physical History of Man. 2d edit. vol. ii. p. 536, et seq.) It will have been remarked that congenital blindness and deafness, though family diseases, or apt to prevail in members of the same generation of the same family, are rarely if ever hereditary. Dr. Adams suggests, that though congenital peculiarities and redundancies are hereditary, connate privations are not so, and that deafness and blindness belong to the latter class; and in this way, provided it is ascertained that connate privations do not descend to offspring, the discrepancy in the law may be reconciled. Dr. Prichard endeavours to adjust the other difference by supposing that the exciting causes of diseases act upon an existing predisposition laid by nature in the original stamina and habit of the body, and that the occurrence of a malady from their application is no proof that it is engendered by them, but that they are the mere occasion on which a congenital weakness previously hidden is rendered manifest. This view he illustrates by the example of gout; but were other instances chosen, such as those of scrofula and consumption occurring in the natives of warm when removed to cold climates, it appears questionable whether the doctrine would be found to apply invariably; whether it would not rather be proved that a morbid peculiarity may be strictly engendered by an external cause, and, being thus engendered, may be transmissible to posterity. Perhaps, too, the rule that acquired peculiarities in general are not hereditary is laid down too absolutely. The writer has in many instances observed in the case of individuals whose complexion and general appearance has been modified by residence in hot climates, that children born to them subsequently to such residence have resembled them rather in their acquired than primary mien.

It is natural to inquire whether we derive any useful inference from our knowledge of the hereditary property of certain diseases? The most important and practical inference that can be deduced is, that the descendants of those who labour under any hereditary disease should be shielded as far as possible from its exciting causes; for the predisposition is of various degrees, in some so intense that at a certain period the disease occurs by the spontaneous act of the constitution; but in others so slight, that the co-operation of noxious agents is required to render it manifest. Hence the descendants of the gouty should observe the most rigid temperance; certain climates should be selected, if possible, till a certain period of life, for those of the consumptive; the offspring of the maniacal should be guarded as much as possible from mental irritation, and from all habits of life calculated to call their inherent tendency into action; whilst a nutritious and invigorating regimen and warmth should be appropriated to those who, there is reason to think, have derived the scrofulous diathesis from their ancestors.

Another practical inference which might be deduced is, the propriety of avoiding matrimonial alliances between families possessing the same hereditary taint; and, generally, of forbidding all such alliances between kindred families, for few are perhaps free from some congenital weakness or susceptibility, and, to use the phrase of the cattle-breeders, all predispositions to disease are rendered more intense in families by breeding *in and in.*

JOSEPH BROWN.

[HERMAPHRODISM.—See SEX, (DOUBTFUL.)]

HERPES, from the Greek ἕρπειν, to creep. *Syn.* Cytisma herpes (*Young*); Lepidosis herpes (*Good*); Neshr (*Arabic*); Zittermahl; die Flechte (*German*); Dartre (*French*); Vesicular tetter.

Herpes is an inflammatory disease of the skin, terminating in the discharge of a quantity of thin fluid sufficient to elevate the cuticle into small irregular vesicles, which appear in groups or circumscribed patches of various forms, on an inflamed base, the skin in the intervals retaining its healthy aspect. The disease, which is non-contagious, generally passes through a regular course "of increase, maturation, and decline, and terminates in about ten, twelve, or fourteen days." (Bateman's Practical Synopsis; 7th edit. p. 319.) Biett and Rayer assert that it is rarely preceded by fever, and unless when it proves critical of some other disease, that it cannot be referred to any appreciable cause. Our own experience, however, accords with that of Bateman, that it is frequently preceded by considerable constitutional disorder. At first the vesicles are filled with a colourless pellucid fluid, which gradually becomes opaque and of a yellowish hue, but not purulent; after which it forms crusts, which droop off, except when ulceration occurs. The eruption is attended with tingling; sometimes with lancinating pains, as if hot needles were run into the part. In some of the forms of the disease, as the vesicles concrete and the crusts fall off in one part, fresh patches arise in the immediate vicinity, and thus the disease creeps over a considerable portion of the skin.

Herpes is distinguished from pompholyx by the vesicles appearing in groups or patches on an inflamed base; and from erysipelas, by the vesicles not being preceded by redness and tumefaction; by their distinct yet clustered character, and the state of the skin between the clusters. It is scarcely possible to confound it with eczema or impetigo, neither of which assume the purely vesicular form, nor run the same regular progress within a limited period; and both of which form thin plates or semi-pellucid crusts, from under which a thin acrid fluid exudes, instead of the dry harsh scab which characterizes herpes.

In Bateman's synopsis we find the various appearances of herpes constituting six distinct species; and in this view of the subject he is followed by Rayer. (Traité Théorique et Pratique des Maladies de la Peau, tome i. p. 226.) Biett, on the contrary, considers every form of herpes a variety of one species, *phlyctænodes*, differing only in the seat of the eruption, or in the figure of the clusters of vesicles. Thus he regards herpes *labialis* and herpes *præputialis* as varieties of herpes *phlyctænodes*, distinguished from it only by having a determined site; while herpes *zoster*, herpes *circinatus*, and herpes *iris*, are regarded equally as varieties, differing merely in the form of the vesicular patches. In the view which an extensive experience has led us to take of the generic disease, we feel authorized in dividing it into two distinct species, herpes *phlyctænodes* and herpes *iris*, the characteristics of which are well defined: all the other forms, generally regarded as species, will be found to be mere varieties of herpes *phlyctænodes*, however they may differ in the figure of the clusters, or in the parts on which they appear: indeed the modifications which both herpes *labialis* and herpes *præputialis* display depend on circumstances connected altogether with the parts on which they appear. Taking this view of the general disease, we are of opinion that all its forms are comprehended in the following arrangement:—

Species 1. H. *phlyctænodes*.
Var. *a*. H. zoster.
— *b*. H. circinatus.
— *c*. H. labialis.
— *d*. H. præputialis.
——— 2. H. *iris*.

Species 1. Herpes Phlyctænodes.—This species appears in irregular agglomerated groups of small, transparent, globular vesicles, not larger than a millet-seed. It is usually preceded by one or more slight febrile attacks, accompanied by thirst, heat of stomach, and flatulence, which are not immediately relieved by the appearance of the eruption, but on the contrary are sometimes aggravated by the heat and tingling in the patches of vesicles as they continue successively to appear. The clusters rise in various parts of the body; the cheeks, the forehead, the neck, the trunk, and the extremities being indiscriminately the seat of the eruption. The vesicles differ greatly in size, but the smaller are comparatively the most numerous; and when the disease spreads extensively, the clusters are chiefly made up of small vesicles.

On the spot where each cluster appears, a sensation of heat and tingling is felt; at which time, says Biett, minute red points may be detected, very closely grouped, and over these on the following day the vesicles display themselves on an inflamed base, resisting compression, and varying in size, from that of a small millet-seed to that of a pea. We have never observed the previous state here described, although its existence is highly probable: in general we have seen the spots, which afterwards became groups of vesicles, appearing as simple red blotches, which feel rough when the finger is passed over them. Rayer states that the number of vesicles in each group varies from twelve to fifteen or more. (Op. cit. p. 227.) Several of these groups rise together, forming clusters, in which the intervening skin retains its natural colour; although within, and for a small space beyond each group, it is red. The fluid in the vesicles is at first generally colourless, but occasionally of a brownish hue; it gradually thickens, probably owing to the absorption of the watery part, and in ten or twelve hours acquires opacity and looks milky or pus-like; sometimes in the larger vesicles it appears bloody. About the fourth day the larger vesicles break and discharge their fluid; the inflamed surface acquires a dull purple hue; and while many of the smaller vesicles flatten and disappear, the larger dry and change into irregular yellow or brownish crusts, which fall off about the eighth or tenth day, although sometimes not until the fifteenth or twentieth. The skin for a considerable time retains a reddish hue, indicating the seat of the previous eruption. In this manner the successive clusters run their course.

Authors agree that the causes of herpes *phlyctænodes* are very obscure. In almost every instance which we have seen, the immediate or exciting cause appears to be derangement of the digestive organs accompanied by a highly irritable state of the system. It has appeared also occasionally to proceed from catarrhal or other inflammatory febrile affections, in which the eruption may be regarded as a translation of diseased action from the mucous membrane of the skin.

The continental writers have laboured to mark the symptoms which distinguish herpes *phlyctænodes* from pemphigus. In our opinion it is scarcely possible to confound them; in the one the eruption consists of distinct solitary bullæ, in the other of clusters of vesicles upon isolated surfaces.

With respect to the treatment of herpes *phlyctænodes*, as this differs little from that which is requisite in the varieties, the notice of it may be deferred until these shall have been described.

Var. *a*. **Herpes Zoster** (*shingles*) differs from herpes *phlyctænodes* chiefly in the size of the vesicles forming the groups, in the seat of the disease, and the manner in which the clusters successively appear and extend over the body. The vesicles, however closely agglomerated, are from the first distinct: they generally enlarge in twenty-four hours to the size of pearls; are perfectly transparent and filled with a limpid fluid: the inflamed base of the pustules, which are considerably larger and more irregular than those of herpes *phlyctænodes*, extends some distance beyond the vesicles. The most frequent seat of this variety is the trunk of the body, and as the patches of vesicles successively appear, they extend either round the waist in an oblique direction, like a sword belt, or across the shoulders, or from the shoulder they extend to the arms, or from the nates down the thighs, in an oblique direction to the knee. A perpendicular position of the clusters is very rare: Rayer mentions having seen it on the thigh: he also describes a case in which it extended from the face into the mouth. "La moitié gauche de la langue est tumifiée, épaisse, rouge, et converte de plaques

blanches, molles, irrégulières. Les unes ont les volumes des vésicules de la peau, les autres se rapprochent des bulles par leur grande dimension. L'épaisseur de ces plaques est égale à celle d'une feuille de papier, &c. La salive, sécrétée en abondance, est filante; l'haleine est fétide, mais n'a point l'odeur particulière qui s'exhale de la bouche chez les personnes qui ont abusé des preparations mericurielles." (Traité des Maladies de la Peau, tome i. p. 230.) The most frequent seat of the clusters is the lower part of the thorax; the right side is more frequently attacked than the left: the eruption never appears on both sides at the same time.

Rayer has placed this variety among the bullæ, although he regards it as holding an intermediate place between bullæ and vesicular inflammation.[*] The eruption of shingles appears to be an affection solely of the reticular web of the cuticle, and never extends, like erysipelas, to the subcutaneous cellular tissue.

The premonitory symptoms in shingles are languor, loss of appetite, febrile rigors, headach, a quickened but small pulse, sometimes sickness, pains darting across the chest and epigastrium, and a sensation of scalding heat or deep-seated pain in the spot where the first patches of eruption are likely to appear. In old persons, and in those of delicate habits, this feeling of local heat and pain often continues for a week or more previous to the appearance of the eruption, by the coming out of which it is almost instantly relieved. It is sometimes so severe, that it has been mistaken for pleurisy, and treated by venesection and other depletory means. At other times the precursory fever is so slight, that the first notice which the patient receives of the presence of the disease is a sensation of heat and tingling on some part of the trunk, where he finds on examination patches of shining, pearly, or silvery vesicles, already formed. Sometimes the patches appear at the opposite extremities of the zone, and join by the successive patches extending towards the centre. The vesicles in the separate clusters attain their greatest size, which seldom exceeds that of a pea, in three or four days; and at this time the inflammation of the base of the patch is at its height, of a vivid redness, becoming fainter as it extends beyond the limits of the cluster of vesicles. Generally before the fourth day, while the new clusters begin to appear, the lymph in the first set of vesicles becomes opaque, acquires a milky or yellowish hue, and approaches in some instances almost to the state of pus. The inflammation of the base now changes to a bluish or livid hue, and the vesicles flatten or subside: some, however, break, and either spontaneously or from friction discharge their fluid, which concretes in dark-coloured scabs. These crusts harden and adhere firmly for ten or twelve days, and then fall off, leaving the skin red and tender; and, when the vesicles have been rubbed and become ulcerated, cicatrices or pits sometimes remain. These symptoms vary according to circumstances; thus in old people, or those enfeebled by want, the vesicles enlarge almost into bullæ, break soon, and almost always ulcerate; and even, according to Biett, occasionally have been followed by gangrene. Yet the same physician has never seen the disease attended with much fever or general derangement of the system.

The febrile symptoms which we have observed, generally subsided when the eruption was complete, but not always; and we have seen cases in which the uncomfortable feelings seemed rather augmented than diminished during the whole progress of the eruption; and more especially the deep-seated pain described by Bateman, which, he says, "continues to the latter stages of the disease, and is not easily allayed by anodynes."

Shingles is not a contagious disorder, and may occur several times in the same individual. In the greater number of instances it appears towards the termination of some acute disease. It occurs most frequently in persons between twelve and twenty-five years of age, although occasionally the aged suffer severely from it. Those who have a delicate and irritable skin are most liable to its attacks. It prevails more in summer and autumn than in spring and winter.

It is scarcely possible to mistake shingles for any other vesicular disease, unless in its early stage, when it resembles in some degree herpes *phlyctænodes;* but it may be distinguished by the appearance of the red patches on which new clusters of vesicles are about to appear. The absence of swelling of the skin, and of the disappearance of redness on pressure, readily distinguish it from erysipelas.

The general treatment of shingles is the same as that of the other varieties of herpes *phlyctænodes*, and therefore need not be detailed here. With respect to local applications, a gently stimulant spirituous lotion to the inflamed clusters, to which a portion of tincture of opium may be added when the pain and irritation are severe, may be employed. By these means the vesicles are prevented from breaking; but when this occurs, nothing is so serviceable as the oxide of zinc ointment.

Var. *b.* **Herpes Circinatus.** *Ringworm.*—This variety of herpes *phlyctænodes* is of very frequent occurrence; and being unaccompanied with any constitutional affection, is of little moment. The vesicles are small, and form in a circle, inclosing a portion of the skin seemingly unaffected, while a red inflammatory blush extends to some distance around the cuticle of the circle of vesicles. The fluid contained in the vesicles is generally discharged in a few days; after which dark prominent crusts concrete over them; and at this time the centre, which seemed free from disease, becomes rough and exfoliates.

The eruption of the vesicle is preceded by a red spot of various sizes, from half an inch to two inches in diameter: it is generally circular, but occasionally oval. In a very short time after the redness appears, the vesicles, minute and globular, can be traced by the aid of a glass, filled with a transparent fluid, which becomes opaque before they burst. Sometimes the fluid is absorbed; in which case the vesicles shrink, and exfoliate almost imperceptibly. The period in which each circle runs its course is from eight to ten days; but the circles appear in succession, and as each requires a period of eight or ten days to be perfected and desquamate, the disease is thus protracted to two or three weeks or longer. When the crusts fall off, they leave a redness which remains for some time; but no other inconvenience attends the eruption. In some instances, instead of the regular circle, the whole central spot is covered with minute vesicles, which enlarge sometimes to a considerable size, and are accompanied with much heat, pain, and irritation. When this form of disease occurs, the clusters rapidly spread and pass over the great part of the arms, the places on which this variety generally shows itself. The feverish state does not at once abate after the eruption appears; it contines to increase for five or six days; and about the ninth day the vesicles break, and the fever suddenly ceases.

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[*] Cette maladie forme réellement l'anneau intermédiare entre les inflammations bulleuses et les inflammations vésiculeuses. Tome i. p. 202.

The vesicular circles most commonly appear on the arms, the shoulders, the chest, the neck, and the face; and in young girls of a delicate frame of body, with a thin and irritable skin, the circles frequently display themselves on the chin.

The disease is very frequent among children, and is commonly but erroneously supposed to be contagious. Its exciting causes are obscure; and it is ushered in merely by a sensation of slight tingling and itching.

This variety of herpes, if it appear on the forehead and at the roots of the hair, may be mistaken for porrigo *scutulata;* but the vesicular character of the eruption, the regular course which it runs, and the hair not falling off, very easily enable us to distinguish it from the contagious ringworm of the scalp, as porrigo scutulata is termed.

No internal treatment is required: lotions containing either of the mineral alkalies, or sulphate of zinc, or alum, may be applied with advantage. Black writing-ink is a domestic application which has proved as beneficial as any that has been suggested.

Var. *c.* **Herpes Labialis.** *Herpes of the Lips.*—This variety differs only in the situation which it occupies. It sometimes extends round the whole mouth, sometimes its seat is the upper, sometimes only the lower lip. When it does not surround the mouth, it is not unusually confined to the angles: wherever it appears it rarely attacks the true lips, but frequently impinges upon the line of union between these and the skin, and at the same time patches of the eruption rise on the cheeks and alæ of the nose. The vesicles, like those of the other varieties, at first contain a transparent lymph, which in twenty-four hours assumes a purulent aspect, and in three or four days becomes more yellow than that usually found in pustules, few crusts forming. The lips, as the disease advances, swell, become hard, sore, stiff, and painful, with a sensation of great heat in the affected parts. After the crusts fall, the surface remains red, harsh, and painful; cracking every time the patient laughs or opens the mouth wider than usual.

Herpes labialis is more decidedly the sequel of a distinct febrile state of the system than any of the other varieties. This febrile state is often of a catarrhal kind, and not unfrequently results from sudden alternations of heat and cold, particularly sudden exposure to damp cold air, after having been confined in a hot or crowded room. The febrile affection is manifested by rigors, headach, pains in the limbs, anorexia, lassitude, and languor. This variety of herpes is often a critical eruption, appearing on the decline of acute diseases, which rapidly disappear as soon as the vesicles, or the inflamed bases on which they rise, show themselves. Severe catarrhs often terminate in this manner; and the appearance of this vesicular disease is considered a favourable symptom in affections of the bowels, and in the latter stages of remittent and low malignant fevers. It occasionally becomes chronic.

In general this variety requires no particular treatment; successive crops of the eruption rarely appearing, so that it runs its course in three or four days, and spontaneously disappears. To allay the heat and itching, diluted alcohol or a solution of zinc proves serviceable. When it becomes chronic, (and in this state it is almost always symptomatic of some deranged state of the digestive organs,) the hydrargyrum cum creta, combined with James's powder in the proportion of ten grains of the former and four of the latter, may be administered every night at bed-time; and during the day the liquor potassæ, in full doses, taken in the decoction of the root of the rumex *acutus* or *obtusifolius*, rarely fails in affording relief. The decoction should be made at first with not more than an ounce of the sliced root to a quart of water, and reduced by boiling to a third; but if the disease do not soon yield, double this strength will be required. The diet should be light, and consist chiefly of milk and farinaceous matters. The diluted ointment of nitrate of mercury is the best topical application in this chronic form of herpes labialis.

Var. *d.* **Herpes præputialis.** *Herpes of the prepuce.*—Although this variety of herpes is not uncommon, yet until Dr. Willan pointed it out as an herpetic eruption, and Bateman accurately described it, it was often confounded with syphilis and treated as such. It more nearly resembles the last variety, herpes labialis, than any of the others. It appears on both the external and internal surface of the prepuce, and not unfrequently on the glans penis. The eruption of vesicles is preceded by a teasing itching and tingling in the prepuce, which appears slightly swollen and inflamed, and covered with two or three red patches, on which, when closely examined, minute vesicles may be observed rising nearly in a circle. These rapidly increase in size; the lymph loses its transparency and assumes a milky hue; and in another day they are coherent and almost pustular. If the vesicles be not disturbed, they sometimes do not break, but the lymph is absorbed, and the shrunk vesicles desquamate; but at other times they break, and form ulcers covered with a whitish fur, and having an elevated base, not unlike the aspect which chancre assumes; and when they are rubbed, or improperly managed by caustic or acrid applications, a tedious state of ulceration sometimes supervenes. When the vesicular patches are situated on the internal surface of the prepuce and on the glans penis, the inflammation is more severe than when the exterior of the organ is the seat of the disease. In some instances the itching and tingling which accompany

the eruption are so severe as to prevent sleep. On the exterior, the vesicles terminate about the fifth or sixth day, forming small, hard, acuminated scabs, under which the healing process is carried on; and about the ninth or tenth day the scabs fall and leave the surface slightly indented. In many instances the disease does not run this regular course, but yields to very simple means in
ight hours.

s variety of herpes is rarely observed in
men; on the contrary, persons in the de-
f life are most subject to it, and it not un-
atly accompanies stricture of the urethra,
irritable state of this canal. It is also some-
produced by an acrid state of the secretion
root of the glans; and we have seen its
ch checked by keeping the part between
ans and the prepuce clean with soap and
ater, and afterwards introducing a small
of clean dry lint to absorb the acrid fluid.
ateman properly rejects the idea of Mr.
n, that it is caused by mercury. The most
case of the disease which we have seen
d in a gentleman who had never taken mer-
We cannot, however, agree with the opinion
is altogether independent of stricture, or at
f irritable urethra: we think that we have
served it sympathizing with derangements
chylopoietic viscera. It is more liable to
than any of the other forms of herpes.

all these different descriptions of herpetic
ons are mere varieties of one genus, the gene-
atment required is nearly the same in all; and
regulated chiefly by the nature and degree
fever which precedes and accompanies the
n. This is seldom so severe as to require the use of the lancet, unless the patient labours under some acute disease of which the herpatic affection may be regarded as symptomatic. More frequently herpes about the mouth and occasionally on the ears occurs as a salutary crisis of fevers, and ought not to be interfered with. If the digestive organs be much deranged, and the eruption can be traced to that source, an emetic will prove useful in clearing away the superabounding acid which generally prevails, and is undoubtedly one cause of the irritation of the intestinal membrane with which the skin sympathizes.

No class of medicines so effectually fulfil the indication to be answered in herpes as mild purgatives, especially those containing magnesia, as they carry off a large portion of the existing acid, whilst the magnesia allays the morbid irritability of the gastric surface. Neither calomel nor any of the very active cathartics are in general required. Diaphoretics are not indicated; and even when much heat of skin exists, more advantage is derived from the free use of diluents than from antimonials or any medicines of that class.

One of the most distressing symptoms in severe cases of shingles is the deep-seated pain which often occurs about the thorax, and when the pulse is at the same time quick and hard, it has, as already stated, led to the supposition that pleurisy is present. The lancet brings no relief in this case; but much comfort is afforded, and sleep secured, by a combination of colchicum, magnesia, and an opiate. The following form is that which we have found most serviceable:

℞ Magnesiæ ℈i.
Vini colchici seminum *m* xlviii.
Tincturæ opii *m* xxx.
Misturæ camphoræ f℥xi. M.
Sit haustus horâ somni sumendus.

In the chronic state of herpes *labialis* the treatment we have already described is commonly successful; but when the disease is obstinate, it is necessary to place the patient under a course of hydrargyrum cum creta, with decoction of sarsaparilla or of elm bark. Upon the whole, although we cannot refuse to accord with the opinions of most writers on affections of the skin, that herpes requires less of the medici diligentia than almost any other of the numerous list of cutaneous eruptions, yet the young practitioner will feel frequent disappointments if he expects all cases of herpes to run so favourable a course. It is only when they are critical of some acute disease that he may altogether disregard them: on the contrary he will sometimes find the most acute suffering precede the eruption, and a degree of general derangement of the system often so obscure as to complicate and restrain the efforts of the physician. In such cases the first object is to gain an accurate knowledge of the state of the stomach and bowels, that of the liver and the chest; and if the nervous system which is often the case, be involved in the general derangement, to ascertain how far this depends on mental causes, as many cases of herpes, in all its varieties, may be clearly traced to grief, anxiety, and other mental sources.

Species 2. HERPES IRIS. — This species differs materially in all its characteristics from the former. It was first announced as a herpetic affection by Dr. Willan, and afterwards accurately described by Bateman. Its usual seat is on the back of the hands; but it has appeared on all parts of the body; most commonly, however, where there is little fleshy substance. It first displays itself in small red spots, which, as they change colour, are surrounded by fresh circles of inflammation, which become vesicular. The patches gradually extend until they attain the size of a shilling, the circumference assuming a radiated or star-like appearance. In the description of Bateman we are told that the first circle, surrounding the central vesicle which is yellowish, "is of a dark or brownish red colour; the second is nearly of the same colour as the centre; the third, which is narrower than the rest, is of a dark red colour; the fourth and outer ring, or areola, does not appear until the seventh, eighth, or ninth day, and is of a light red hue, which is gradually lost in the ordinary colour of the skin." (Bateman's Synop. p. 340.) The variously coloured rings so well defined in this description are, however, rarely observed.

This species of herpes most frequently appears in children and fair women; but neither the predisposing nor the exciting causes are very obvious. Like some of the varieties of herpes *phlyctænodes*, it has occasionally occurred as a critical eruption. In some individuals, according to Bateman, it has recurred several times, "occupying the same parts, and going through its course in the same periods of time."

It is scarcely possible to confound herpes *iris* with any other disease. There is one species of roseola which extends in successive circles, but it wants the vesicles, which are sufficient to characterize the herpetic disease.

With regard to the treatment of this species of herpes little requires to be said: no internal medicines are required; nor do we know any local applications likely to prove serviceable in shortening the disease. The warm bath employed only for twenty minutes, and exercise taken immediately after it, has appeared to be useful. Rayer recommends decoctions of linseed to be employed as fomentations: we have had no experience of their use, so that we are not authorised to give an opinion on the subject. Moderate bloodletting, gentle aperient medicines, and a combination of the solution of arsenic and of pure potassa, with the decoction of the rumex obtusifolius, have been productive of more benefit than any other means which we have employed. A small piece of soap-plaster laid over the parts affected, has occasionally been productive of much benefit.

[It may be proper to add, that in regard to the local treatment of the different varieties of herpes, difference of opinion has existed. Whilst some restrict it to washing the parts with tepid milk and water, or with mucilage, others recommend oleaginous and other applications, possessed more or less of astringent or excitant properties. Chlorinated lime; chlorine; hydrocyanic acid; creasote, in solution or ointment; soot; cyanuret of mercury; red iodide of mercury; tincture of iodine pencilled over the parts, especially in herpes circinatus; iodide of potassium; cod-liver oil, used externally and internally, have all been employed. Very obstinate cases may require, also, the external use of the preparations of iodine, combined with syrup, to modify the condition of the circulating fluid, and through it that of the system of nutrition.

It has been recommended to open the vesicles early, and apply an emollient catiplasm over them; and it is affirmed, that in herpes *zoster*, where the pain is very severe, the best effects result from the application of a dozen leeches to the inflamed part. If done early, before many vesicles have appeared, the farther progress of the disease, according to Dr. Mackintosh, (*Principles of Pathology and Practice of Physic*, 2d Amer, edit. ii. 286, Philad. 1837,) may be stopped. Small blisters, applied to the inflamed skin, in the vicinity of the vesicles, it is said, check their extension, and produce a shrivelling of those already formed.]

A. T. Thomson.

HICCUP.—Hiccup or *hickup*, sometimes written *hiccough*, apparently from a mistaken notion of the etymology of the word. It may have been immediately derived to us from the Danish; but its origin in that as well as in some other languages was most probably an attempt to imitate the peculiar sound which it denotes. It corresponds with the French *hoquet*, and the German *schlucken;* but the Greek λὺγξ or λυγμὸς, and the Latin *singultus*, though applied to this affection, seem also to have designated the somewhat analogous one which we call *sobbing*.

The phenomena of hiccup, as observed by a by-stander, may be described to consist in a sudden, rapid, and brief inspiration (such as may properly be called convulsive), instantly followed by expiration; each of these movements being accompanied by a noise not heard in common respiration, and these noises following each other in quick succession, produce that peculiar dissyllabic sound by which the affection is characterized. The convulsive movements return at short intervals, commonly varying from half a minute to a minute, but sometimes of longer duration, and are attended by an uneasy sensation at the præcordia, which, when the hiccup is violent and often repeated, amounts even to pain.

Such are the phenomena presented by this affection, apart from any attempt to explain its *mechanism*. What this is has been the subject of much conjecture. The oldest opinion seems to have been that it consisted in a convulsive movement of the stomach; an opinion which, in the then very imperfect state of physiology, was not an unnatural inference from the well-known fact that the exciting cause is commonly some impression directly made upon that organ. Since, however, the functions of the stomach and neighbouring parts have been more accurately investigated, most authors have concurred in referring the motions which constitute hiccup chiefly to the muscles employed in respiration, and particularly to the diaphragm. That causes acting upon the stomach are adequate to excite these muscles to violent and irregular contractions is familiarly known. Fits of coughing (especially in the hooping-cough) and of spasmodic asthma are often produced in this way; and whatever difference of opinion may still exist as to the particular combination of muscular actions by which vomiting is effected, it can scarcely be doubtful, especially since the experiments of Magendie, that the expulsion of the contents of the stomach is ordinarily in great measure produced by the agency of some of the respiratory muscles. If, however, two phenomena, so widely differing in their results as vomiting and hiccup, are referred chiefly to the same mechanical powers, some other cause of their difference must exist. It is probably owing to an inverted action of the muscular fibres of the stomach and gullet co-operating with the other agents in the former, and not in the latter, that the rejection of the contents of the stomach takes place in the one, but does not happen in the other.

The modern opinion, which ascribes hiccup chiefly to the respiratory muscles, rests upon the following among other arguments.—1. The phenomena of the affection, as above described, appear to consist chiefly in a convulsive act of respiration. 2. The researches of physiologists have clearly shown that the muscles in question, or at least some of them, are capable of movements corresponding with those of hiccup in rapidity and violence. 3. We are without any satisfactory evidence that such motions are ever performed by the muscular fibres of the stomach. 4. A consideration of two popular methods of preventing the recurrence of hiccup, namely, holding in the breath for a considerable time, and making a protracted deglutition by sipping liquids; both of which seem to owe their efficacy to the power of the will over the respiratory muscles.

Some writers, while they admit the agency of the diaphragm in producing hiccup, have supposed the œsophagus to co-operate with it. Thus Mahon (Encyclopédie Méthodique) explains the affection as consisting in "a convulsive movement of the œsophagus, which draws the stomach and diaphragm upwards, whilst at the same time the diaphragm itself experiences a convulsion which draws it downwards."* It is, however, very questionable whether the œsophagus ever executes movements of the kind here supposed. With regard to the peculiar noise which accompanies hiccup, there can be little doubt that it is caused by a convulsive or spasmodic action of the muscles about the glottis.

There are two convulsive affections which, without being absolutely identical with ordinary hiccup, so nearly resemble it, that they are designated by the same word, at least in some languages, and must apparently be referred to nearly the same muscular powers. Thus, what is properly called the *hiccup of death*, although owing its name to a similarity to the true hiccup, in some respects differs from it. According to Double, it consists of two quick and forcible inspirations preceding a feeble and protracted expiration. The affection which we call *sobbing* is so analogous to hiccup, that, as has been before observed, the Greeks and Romans designated both by the same words. Indeed, not only do they nearly resemble one another, but sobbing in children often passes into perfect hiccup.

Having considered the mechanism of the affection, we may next advert to its *causes*, and the circumstances under which it occurs. In relation to these points, all the cases which are met with may be referred to two general heads, according as the hiccup is or is not preceded or accompanied by some other recognised morbid affection, of which it may be considered a symptom or consequence. It will be convenient to designate these two divisions by the terms symptomatic and idiopathic, although the strict propriety of such words is questionable.

By far the most frequent cause of *idiopathic hiccup* is some impression directly made upon the stomach; as, for example, by very hot or highly seasoned food, especially in a liquid form; by alcoholic and other stimulant liquors; and by food swallowed hastily, or in two great quantity, especially after long fasting. As the affection, when produced by causes of this kind, generally occurs almost immediately after the irritating matter is taken into the stomach, it may be reasonably inferred that the impression upon that organ, which calls forth the muscular efforts by which the hiccup is affected, is chiefly made upon its cardiac extremity; and we shall hereafter see that one mode of explaining the final cause of the affection is by a deduction from this opinion.

The occasional causes just enumerated evidently act upon the sensibility of the lining membrane of the stomach; but there are others which seem to operate by a mechanical impulse communicated to the whole organ. Thus, in children more particularly, any vehement or convulsive movement of the respiratory muscles, as violent crying and sobbing, or a fit of coughing, is apt to end in hiccup. The same occasionally happens with vomiting, as was observed by Hippocrates, who noted it as an unfavourable occurrence.

A cause of a very different description from the above is fasting. It implies a prolonged absence of the proper and accustomed stimulus of the stomach; and the influence of this negative impression seems to afford a more probable explanation of the occurrence than the hypothesis which has referred it to the supposed irritation of the gastric juice.

Idiopathic hiccup, though generally, is by no means exclusively produced by causes directly influencing the stomach, emotions of the mind, copious evacuations, as bleeding and purging; cold applied to the surface of the body, as the epigastrium, feet, &c.; and in fact, where there is a predisposition to it, almost any impression, external or internal, may call it forth. John Hunter observes that it often accompanies local irritation after operations of various kinds. To inquire whether such causes determine the muscular movements by which hiccup is effected, through the medium of an intervening impression upon the stomach, would be a fruitless indulgence in speculation.

The tendency of occasional causes, of whatever kind, to induce this affection, is of course very much dependent upon the degree of predisposition in the individual. This may perhaps be stated in general terms to arise from the same circumstances as those which appear to favour the occurrence of other convulsive movements, and especially from that condition of the system which is expressed by the common but indefinite terms of debility and irritability, or mobility. Thus it is familiar that childhood and old age are more liable to the affection than the middle periods of life; and that the female sex, especially in the puerperal state, is more subject to it than the male. There seems, however, to be ground for a more definite view of the matter, and for referring the predisposition, at least, in a majority of cases, to a preternatural sensibility of the stomach, or to a tendency in that organ to functional derangement. Such a condition or tendency is well known to exist in the earlier and later periods of life, and during gestation; and it is probably owing to its presence in an unusual degree that, in some individuals, even a moderate quantity of the mildest food will often cause a fit of hiccup. Indeed in such persons it not unfrequently occurs without the intervention of any known cause.

The predisposition, in whatever it consists, may be either original or acquired. In the latter case it can sometimes be traced to debilitating circumstances, as excessive evacuations; but it is much more commonly attributable to causes which directly impair the digestive powers, as the abuse of ardent spirits, excesses in diet, &c.; and such an impaired state of the function of digestion is probably one principal cause of the peculiar liability of old people.

Idiopathic hiccup is commonly too slight and transient an affection to merit the name of disease. Sometimes, however, by its violence, but more often by its duration, it assumes a graver character, and has even appeared to be fatal, as will be more particularly stated when the terminations of the affection come to be considered It has occasionally been observed to recur periodically, at regular intervals, as, for example, annually, and at the same period of the year. Thus Heberden speaks of cases, some of them unaccompanied by any other appreciable morbid affection, in which it lasted for many months, and even for years, being in some constant, in others intermitting. Dr. Good also refers to cases in which it returned at irregular intervals, for periods of from four to twenty-four years; in others in which it continued incessant, or nearly so, for eight and twelve days, and even three months.

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* "Un mouvement convulsif de l'œsophage, qui tire en haut l'estomach et le diaphragme, tandis qu'en même tems le diaphragme lui-même éprouve une convulsion qui le tire en bas."

The second division of cases of hiccup includes those in which it co-exists with, and appears to depend on, some other disease as its cause: being then what we call a *symptomatic* affection. It has been noted by authors as occurring principally in the following diseases:—fevers, both continued and intermitting, especially the latter; a complication which seems to have been formerly not uncommon, as the epithet *singultuosa* was applied to fevers accompanied by hiccup throughout their course; inflammation of the stomach, bowels, and liver; peritonitis, perhaps more particularly when the peritoneal coat of the diaphragm is involved; strangulated hernia; irritation of the mucous membrane of the alimentary canal, including worms, dentition, and the operation of poisons; disorders of the digestive function generally, especially when attended by the acid eructations which cause heart-burn; jaundice; uterine irritation, whether connected with gestation or not. Thus severe and protracted hiccup has been sometimes observed as one of the attendants of hysteria. It is also enumerated by some authors among the symptoms of inflammation of the spinal cord or its membranes; and Heberden states that it sometimes accompanies paralysis, and precedes epileptic fits. Of more uncommon instances, one deserves to be mentioned, because the hiccup is said to have been fatal. It is a case related by Bobe-Moreau, and cited by De Lens, (Art. *Hoquet*, Dict. des Sc. Méd.) in which a severe hiccup accompanied an abscess in the upper part of the pharynx: and the death of the patient is ascribed to the symptomatic rather than to the primary affection. Some accidents affecting the diaphragm and neighbouring parts are also stated to be more or less commonly followed by hiccup: such are penetrating wounds of the abdomen, the passage of any of the abdominal viscera through the diaphragm into the thorax, fracture of the ribs, and depression of the ensiform cartilage.

As the most frequent cause of idiopathic hiccup is some direct irritation of the gastric mucous membrane, so by far the most common morbid affection on which the symptomatic variety depends, is functional or organic derangement of the stomach, and of those organs which are associated with it in the digestive process; a derangement of which habitual excess, particularly in the use of ardent spirits, is undoubtedly the principal origin. With regard to the mode in which the other diseases and accidents above enumerated give rise to hiccup, we seem to have no adequate data on which to reason, and mere speculation would be worse than useless. It will, however, be seen that most of them either directly involve the digestive organs, or others which are known to have a close sympathy with them. The occurrence of hiccup in some of these cases can scarcely be accounted for except by supposing a considerable predisposition to exist; and the same may be said of its appearance under certain circumstances in which it is not strictly referrable either to the symptomatic or idiopathic form, but immediately follows the disappearance of some previously existing disease. The most common case of this kind is the sudden cessation of ague, of which numerous examples are found in the older writers. Among others, Fred. Hoffmann mentions instances in which the hiccup assumed both a continuous and periodical form. It has also been observed to ensue upon the disappearance of continued fever, gout, rheumatism, and cutaneous diseases, and upon the cessation of a natural or accidental evacuation, as the menses, hemorrhoids, and diarrhœa. When originating in this way, it is sometimes very tedious and obstinate; as, for example, when connected with amenorrhœa, not ceasing till the menstrual evacuation is re-established.

Among the circumstances which determine the occurrence, or rather the continuance of hiccup, we must include the force of habit. The influence of this cause is seen in most if not all of the convulsive movements to which the body is liable; and in none more so than in the one now under consideration.

Of the *terminations* of this affection little need be said. When unconnected with any other severe malady, it almost invariably disappears sooner or later, though its duration is, as we have seen, sometimes very protracted. Cases are, however, reported to have occurred, in which the hiccup itself was the cause of death. One has been already adverted to, in which it was symptomatic. The same author (Bobe-Moreau) relates another, also complicated with difficult deglutition, and speedily fatal; but no cause of the hiccup was discovered by dissection; nor have we any thing beyond conjecture to explain the fatal termination. De Lens, apparently following some preceding authority, states that prolonged hiccup produces swelling and redness of the face; thus implying the possible occurrence of cerebral congestion or of suffocation.

It has been before stated that hiccup sometimes follows and takes the place of other convulsive movements, in the production of which the respiratory muscles are chiefly concerned, In like manner it occasionally terminates in them. The most common instances appears to be that of sneezing: thus Hippocrates says, if hiccup be restrained, sneezing comes on, and the hiccup ceases; and Lanzoni and Bartholin met with hiccup alternating with violent sneezing after tertian ague.

Having thus mentioned most of the facts relating to this affection which seem worthy of notice, it will be proper to make a few remarks on what may be called its final cause. In many of the convulsive movements of the body, such as coughing, sneezing, and vomiting, this is in general sufficiently obvious, being either the expulsion of offending matter, or the protection of the irritated part by exciting secretion, or the restoration of its interrupted circulation and functions. In others, as epilepsy and often asthma, the existence of such a cause, though not admitting of demonstration, seems deducible from a just analogy; and the same may be said of hiccup, at least when excited by some direct irritation of the stomach. In such cases, the final cause is evidently not the rejection of the offending matter; for this would be effected by the act of vomiting, which hiccup has little or no tendency to induce. It is conceivable that one end to which it is directed is the propulsion of the irritating matter towards the duodenum; and thus the final cause has been conjectured to be the removal of such matter from the cardiac extremity to a less sensitive part of the stomach. However this may be, it seems probable that the hiccup subserves another and perhaps more important purpose,—that of determining so much of vital energy to the organs of digestion, especially the stomach, as shall counteract the morbid influence exerted upon them, and induce a vigorous performance of their functions. Such a view well accords with that pleasurable sensation, referred to the epigastric region, which is stated often to follow a fit of hiccup. The same may be said of a fact already mentioned, the occurrence of hiccup as a termination (sometimes apparently a critical one) of continued and intermittent fevers, and also of its occasional appearance at the commencement of eruptive fevers. To these may be added another, mentioned in the first report made by Drs. Russell and Barry, on the cholera at St. Petersburgh. These gentlemen observe it is "singular enough to say, hiccough coming on in the intermediate moments between the threatening of death and the beginning of reaction, is a favourable sign, and generally announces the return of circulation."

Undoubtedly the above view of the final cause is most obviously applicable to those cases in which the hiccup appears as the effect and remedy of a temporary irritation; but it is by no means incongruous with others in which the affection is symptomatic of some grave or fatal lesion. The parts of our frame are so associated by that inexplicable bond which we call sympathy, that irritation in one organ commonly gives rise to a morbid condition or movement in others. This association is governed by certain general laws, often very imperfectly known to us, but the great end of which is manifestly the preservation of the whole body; and the operation of these laws continues, not only when it cannot produce any beneficial effect, but even when it becomes absolutely pernicious. Thus the hiccup which ushers in death is a fruitless effort of nature; while that which results from abdominal wounds, inflammation, or herniæ, may not only be inadequate to accomplish any good purpose, but may even aggravate the existing evil by a repeated concussion of parts which stand in need of perfect rest.

In relation to **diagnosis** generally, the presence or absence of hiccup does not appear to be a guide of much value, since it is pathognomonic of no one morbid affection, but appears under widely different circumstances, from an inconsiderable and temporary irritation to the most formidable and fatal lesions. In cases which present general indications of severe abdominal disease, but not such as enable us to localize it, hiccup may indeed point to some two or three organs more particularly, but it cannot justify us in allocating the disease in any one of them rather than in the others.

As a ground of **prognosis** it may be more valuable; though, for the reasons just stated, scarcely so much so as has been generally represented. Conjoined with other symptoms which portend death, it of course strengthens the evidence of its approach; and when it occurs in affections which have produced great prostration of the vital powers, it no doubt generally implies an expiring and ineffectual struggle of nature. Thus Hippocrates speaks of it as an alarming symptom after hemorrhage, vomiting and purging; and Sydenham appears to have verified the observation, especially with reference to the aged. It is, however, to be borne in mind that even in such circumstances it sometimes indicates (as already stated of cholera) a successful effort of nature to bring about a salutary reaction.

It is not necessary to say much about the **treatment** of an affection which is mostly either too inconsiderable and temporary to call for medical aid, or else a mere symptom of some more formidable malady. In the slighter cases of idiopathic hiccup in which its recurrence seems chiefly the effect of habit, impressions of various kinds, made either upon the organs more immediately concerned, or upon the body generally, are adequate to remove it. Such are the emotions of surprise and fear, a forcible suspension of the act of respiration, sneezing, vomiting, protracted deglutition by sipping liquids, the administration of what are called antispasmodic medicines, including opium; of stimulants, as oil of anise, mint, &c.; of mineral acids, alkalies, and bitter tonics, especially quinine; cold aspersion of the body, &c. The efficacy of many of these remedies is no doubt partly or principally owing to their removing those disorders of the digestive function of which hiccup is so often a symptom.

In cases of a more severe or obstinate nature, cupping at the epigastric region, the application of blisters, sinapisms, and warm plasters to the same parts, and opiate friction, have been resorted to with success. Borrichius relates a case in which the affection returned annually at the same period, and each time yielded to a copious bleeding; a fact which illustrates the remark of Hippocrates, that hiccup, like spasm, may result from repletion (πλήρωσις), as well as evacuation (κένωσις). When it depends upon causes of the latter class, opium is undoubtedly, as Sydenham has told us, the best remedy; and the same may be said of those cases of visceral disease or lesion, in which, supposing recovery to be hopeless, we must still attempt to remove, or at least to mitigate, a distressing symptom.

EDWARD ASH.

[HOMŒOPATHY. (See DISEASE.)]

HOOPING-COUGH.—Hooping-cough has been described under a variety of names, many of which, as chin-cough, kink-cough, &c. refer to its prominent symptom. In France it is usually termed *coqueluche;* in Germany, *keuchhusten, stickhusten,* &c.; in Scotland, *kinkhoast.* It was called tussis convulsiva by Willis, tussis ferina by Hoffman.

The nosological term at present most generally employed to express the disease is *pertussis,* first given to it by Sydenham, and afterwards adopted by Cullen, who arranges it under the class Neurosis, order Spasmi. His definition of the disease is the following:—“Morbus contagiosus, tussis convulsiva, strangulans, cum inspiratione sonora, iterata, sæpe vomitus.”

In the above definition may be found Cullen's opinion as to the contagious nature of the disease. Doubts have, however, been raised upon this point by Laennec, Desruelles, and others, though not supported in such a way as to invalidate the common notions upon the subject.

The disease appears to have two distinct stages. The first lasts generally from ten days to a fortnight, or even three weeks, and is not different from an ordinary catarrh; there is cough and coryza often with very little fever. At the end of a period varying from one to two or three weeks, the second stage commences, and is distinguished by the peculiar convulsive cough. In this cough a number of expirations are made with such violence, and repeated in such a quick succession, that the patient seems to be almost in danger of suffocation. The face and neck are swollen and livid, the eyes protruded and full of tears; at length one or two inspirations are made with similar violence, and by them the peculiar *whooping* sound is produced: a little rest probably follows, and is succeeded by another fit of coughing and another whoop; until, after a succession of these actions, the paroxysm is terminated by vomiting, or a discharge of mucus from the lungs, or perhaps by both. [In very young children, as properly remarked by M. Constant (*Gazette Médicale*, 1836, p. 53,) the expectoration is an important element of diagnosis, as it is the only affection at an early age in which it is met with. (Bell, art. *Coqueluche*, in Dict. des Etudes Médicales, Paris, 1839.)] Sometimes when the *kink* is unusually severe, blood is forced from the nose, ears, and even from the eye-lids; and occasionally it ends, without producing any discharge, in the complete exhaustion of the patient.

The number of paroxysms occurring during a day varies much in different cases, according to the severity of the disease; and the violence of each is diminished in proportion to the freeness of the expectoration. After the disease has continued at its height for two or three weeks, it begins naturally to decline; the paroxysms become less frequent and violent, the expectoration increases, the cough soon loses its peculiar characteristics, and finally wears away altogether, leaving the patient in perfect health. It is to be observed, however, that occasionally, several weeks after the cough has entirely subsided, it may return; and for a long time, if the patient accidentally catch cold, the cough will often assume the spasmodic character, and be accompanied with the “whoop.”

We may safely assert, notwithstanding a contrary surmise advanced by some of the French writers, that hooping-cough rarely if ever affects the same individual twice; and as its usual period of occurrence is during childhood, we shall of course seldom meet the disease among adults.

It is also supposed to be very uncommon in early infancy (for the first two months)—an opinion which is generally true, although we have seen more than one instance of an attack in children three weeks old. When the disease attacks an adult, it generally wants the peculiar whooping inspiration, and the same thing is usually, but not constantly, observed in the cases of very young children.

Nature and seat.—A great variety of opinions have been advanced by different authors respecting the nature of hooping-cough; all, however, that have any bearing on practice may be reduced to the three following:—

1. It was considered to be essentially spasmodic, and to arise from irritation affecting either the brain or some parts of the nervous system, a theory advanced and variously modified by Cullen, Leroy, Lōbenstein, Jahn, and Webster.

Dr. Webster's opinion is “that the actual seat of hooping-cough is in the head, and that the affection of the respiratory organs is only to be considered as the secondary effect, or as an effort of nature to relieve herself by expanding the lungs to an unusual degree, and thereby allowing a greater quantity of blood to flow into them, which may in some degree diminish the fulness and congestion in the head.” (Med. and Phys. Journal, Dec. 1822.)

Lōbenstein and Breschet favoured the idea of the disease having its origin in the phrenic and pneumogastric nerves.

2. A great number of celebrated names may be enumerated in support of the opinion that it is always an inflammatory affection of the bronchial membrane; amongst these are Guersent, Watt, Marcus, Laennec, Dewees, &c.

As the attention of Dr. Watt was particularly directed to hooping-cough attended with bronchial inflammation, in consequence of the death of two of his children from this cause, we shall here give an abstract of his general conclusions on the subject. According to him, “it is in all cases an inflammatory disease of the mucous membrane of the larynx, trachea, bronchi, and air-cells;” and when mild, he says, it may run its course without materially disturbing the other functions of the body, or even the functions of that very membrane where it is seated; and that, whenever it proves dangerous or fatal, it does so by the degree of inflammation in the natural seat of the disease, or by that inflammation extending or being translated to other parts. (Treatise of Chincough, Glasg. 1815.) Dr. Dawson differs from the other writers who support the inflammatory origin of hooping-cough, in confining its first seat to the membrane of the larynx, or, strictly speaking, of the glottis. (Nosological Practice of Physic, London, 1824.)

3. Some consider the disease to be at first inflammatory, afterwards spasmodic. Desruelles advanced this opinion, and proposes to designate hooping-cough by the term “broncho-cephalite.” According to him the disease consists of an inflammation of the bronchi complicated with irritation of the brain, the bronchitis being always primitive, the cerebral irritation always consecutive. So long as the bronchitis is simple, the cough has nothing peculiar; but as soon as the cerebral irritation occurs, the diaphragm and respiratory muscles, and those of the glottis and larynx, are drawn into spasmodic action, and the cough changes its character and becomes convulsive.

This theory has the great recommendation of being in accordance with the practice which is found most beneficial in the treatment of the disease; and it has been justly remarked that the effects of remedies, if accurately observed, are like chemical tests, frequently the means of detecting important differences in objects which otherwise could not have been distinguished from each other.

Amongst so many different opinions respecting the nature of the disease, and the sources from which danger most frequently arises, the young practitioner is left without any steady guide to regulate either his prognosis or his practice.

There can be little doubt that much of this confusion has arisen from the attention of practitioners having been directed so particularly to certain complications as to lead them to overlook the simple disease itself. In order to avoid this error, and to give (as it is hoped) a clearer view of the subject, we shall consider hooping-cough under the four following divisions:—

1. Simple hooping-cough.
2. Hooping-cough complicated with bronchitis or peripneumony.
3. Hooping-cough complicated with disordered bowels or infantile remittent fever.
4. Hooping-cough complicated with convulsions or hydrocephalus.

1. *Simple Hooping-cough.*—The disease may be called *simple*, where after it is fully formed, the fits are neither frequent nor violent, the expectoration is moderate, and the child during the intervals of the cough is quiet, retains his appetite, sleeps well and without fever or difficulty of breathing. A child will be playing apparently in good health, when suddenly he drops his playthings, rushes out of the room, and is heard to cough, whoop, and discharge the contents of his stomach; immediately after which he returns calling out loudly for something to eat. In a few minutes after the paroxysm, his pulse will be quite tranquil; and if the stethoscope be applied to the chest, the respiration will be heard perfectly natural, without any mixture of wheezing.

In such a case the disease must be considered almost, if not altogether, free from danger, and it is scarcely reasonable to suppose the existence of bronchial inflammation.

It may be said that cases of this description are rarely to be met with, and this must be admitted; but if children always lived in pure air, and were in perfect health when attacked by the disease, and if it occurred during the summer season, such cases would be much more frequent.

As this combination of favourable circumstances, however, rarely occurs, so we seldom meet the disease in this simple form; but its occurrence even in a single instance decides the question that the disease, in the second stage at least, is not necessarily inflammatory, as we can hardly presume an inflammation to exist without any symptoms of inflammation being present.

2. *Hooping-cough complicated with Bronchitis or Peripneumony.*—The symptoms of this complication, though sometimes obscure, are generally well marked. According to Cullen, hooping-cough hardly ever proves fatal without considerable dyspnœa having existed for some time. It would appear that in older children, when the disease proves fatal, it is most commonly in consequence of inflammation supervening in the mucous membrane of the lungs. In very many instances where the state of the lungs was ascertained by dissection, the most remarkable phenomenon that presented itself was an inflamed condition of the bronchi, which were almost entirely plugged up with frothy mucus and sero-purulent fluid.

[Of thirty-eight cases of complications, reported by M. Blache, (*Archiv. Général. de Médecine*, 1833, tome 3,) twelve were of pneumonia; and of twenty-eight cases, observed by M. Constant, in the *Hôpital des Enfans* of Paris, ten were of the same affection. (*Gazette Medicale*, 1836, p. 528.)]

A point of the greatest importance in the treatment of the disease is to watch the earliest symptoms of bronchitis, as upon their speedy removal will principally depend the safety of the patient.

We are warned of the occurrence of bronchitis when the pulse becomes permanently quick, small, and hard; the fits of coughing become more frequent and more distressing, and the breathing is hurried in the intervals of the paroxysms; when any exertion or speaking causes increased difficulty of breathing or panting; the lips acquire a livid hue, and the extremities show a great tendency to become cold.

As the disease advances, the pulse becomes more frequent, the difficulty of breathing increases, the alæ nasi are alternately contracted and dilated, and there is great prostration of strength; in many cases the cough is nearly suspended, and when it does occur, it is not accompanied by the usual whoop, and the difficulty of getting up the mucus is greatly increased.

The respirations vary from 60 to 100 in a minute; and if, after having maintained this frequency for twenty-four or thirty-six hours, they come down to 40 or 50, the change generally indicates recovery.

There is considerable and permanent wheezing for the two first days, not audible unless by aid of the stethoscope or by applying the ear to the chest, after which it increases and becomes quite perceptible by laying one hand on the chest and the other on the back. The wheezing is greatest after sleep, or immediately before a paroxysm of coughing.

When the bronchial inflammation cannot be checked, the breathing becomes more hurried and laboured; the wheezing increases; stupor and prostration succeed; the cough is suspended; the pulse becomes nearly imperceptible; the extremities cold; and in the course of eight or ten days from its commencement death ensues from the accumulation of mucus, which apparently produces suffocation.

When the attack terminates favourably, the breathing becomes less hurried, the wheezing diminishes, the cough after a temporary suspension returns, the fever subsides, the countenance assumes a more healthy appearance, and quiet sleep succeeds to distressing restlessness.

On examination after death, the most usual morbid appearance is inflammation of the mucous membrane. The lungs collapse imperfectly, and when cut into, an abundance of frothy and puri thin plates or semi-pellucid crusts, from under which a thin acrid fluid exudes, instead of the dry harsh scab which characterizes herpes.

In Bateman's synopsis we find the various appearances of herpes constituting six distinct species; and in this view of the subject he is followed by Rayer. (Traité Théorique et Pratique des Maladies de la Peau, tome i. p. 226.) Biett, on the contrary, considers every form of herpes a variety of one species, *phlyctænodes*, differing only in the seat of the eruption, or in the figure of the clusters of vesicles. Thus he regards herpes *labialis* and herpes *præputialis* as varieties of herpes *phlyctænodes*, distinguished from it only by having a determined site; while herpes *zoster*, herpes *circinatus*, and herpes *iris*, are regarded equally as varieties, differing merely in the form of the vesicular patches. In the view which an extensive experience has led us to take of the generic disease, we feel authorized in dividing it into two distinct species, herpes *phlyctænodes* and herpes *iris*, the characteristics of which are well defined: all the other forms, generally regarded as species, will be found to be mere varieties of herpes *phlyctænodes*, however they may differ in the figure of the clusters, or in the parts on which they appear: indeed the modifications which both herpes *labialis* and herpes *præputialis* display depend on circumstances connected altogether with the parts on which they appear. Taking this view of the general disease, we are of opinion that all its forms are comprehended in the following arrangement:—

Species 1. H. *phlyctænodes*.
Var. *a*. H. zoster.
— *b*. H. circinatus.
— *c*. H. labialis.
— *d*. H. præputialis.
——— 2. H. *iris*.

Species 1. HERPES PHLYCTÆNODES.—This species appears in irregular agglomerated groups of small, transparent, globular vesicles, not larger than a millet-seed. It is usually preceded by one or more slight febrile attacks, accompanied by thirst, heat of stomach, and flatulence, which are not immediately relieved by the appearance of the eruption, but on the contrary are sometimes aggravated by the heat and tingling in the patches of vesicles as they continue successively to appear. The clusters rise in various parts of the body; the cheeks, the forehead, the neck, the trunk, and the extremities being indiscriminately the seat of the eruption. The vesicles differ greatly in size, but the smaller are comparatively the most numerous; and when the disease spreads extensively, the clusters are chiefly made up of small vesicles.

On the spot where each cluster appears, a sensation of heat and tingling is felt; at which time, says Biett, minute red points may be detected, very closely grouped, and over these on the following day the vesicles display themselves on an inflamed base, resisting compression, and varying in size, from that of a small millet-seed to that of a pea. We have never observed the previous state here described, although its existence is highly probable: in general we have seen the spots, which afterwards became groups of vesicles, appearing as simple red blotches, which feel rough when the finger is passed over them. Rayer states that the number of vesicles in each group varies from twelve to fifteen or more. (Op. cit. p. 227.) Several of these groups rise together, forming clusters, in which the intervening skin retains its natural colour; although within, and for a small space beyond each group, it is red. The fluid in the vesicles is at first generally colourless, but occasionally of a brownish hue; it gradually thickens, probably owing to the absorption of the watery part, and in ten or twelve hours acquires opacity and looks milky or pus-like; sometimes in the larger vesicles it appears bloody. About the fourth day the larger vesicles break and discharge their fluid; the inflamed surface acquires a dull purple hue; and while many of the smaller vesicles flatten and disappear, the larger dry and change into irregular yellow or brownish crusts, which fall off about the eighth or tenth day, although sometimes not until the fifteenth or twentieth. The skin for a considerable time retains a reddish hue, indicating the seat of the previous eruption. In this manner the successive clusters run their course.

Authors agree that the causes of herpes *phlyctænodes* are very obscure. In almost every instance which we have seen, the immediate or exciting cause appears to be derangement of the digestive organs accompanied by a highly irritable state of the system. It has appeared also occasionally to proceed from catarrhal or other inflammatory febrile affections, in which the eruption may be regarded as a translation of diseased action from the mucous membrane of the skin.

The continental writers have laboured to mark the symptoms which distinguish herpes *phlyctænodes* from pemphigus. In our opinion it is scarcely possible to confound them; in the one the eruption consists of distinct solitary bullæ, in the other of clusters of vesicles upon isolated surfaces.

With respect to the treatment of herpes *phlyctænodes*, as this differs little from that which is requisite in the varieties, the notice of it may be deferred until these shall have been described.

Var. *a*. **Herpes Zoster** (*shingles*) differs from herpes *phlyctænodes* chiefly in the size of the vesicles forming the groups, in the seat of the disease, and the manner in which the clusters successively appear and extend over the body. The vesicles, however closely agglomerated, are from the first distinct: they generally enlarge in twenty-four hours to the size of pearls; are perfectly transparent and filled with a limpid fluid: the inflamed base of the pustules, which are considerably larger and more irregular than those of herpes *phlyctænodes*, extends some distance beyond the vesicles. The most frequent seat of this variety is the trunk of the body, and as the patches of vesicles successively appear, they extend either round the waist in an oblique direction, like a sword belt, or across the shoulders, or from the shoulder they extend to the arms, or from the nates down the thighs, in an oblique direction to the knee. A perpendicular position of the clusters is very rare: Rayer mentions having seen it on the thigh: he also describes a case in which it extended from the face into the mouth. "La moitié gauche de la langue est tumifiée, épaisse, rouge, et couverte de plaques

blanches, molles, irrégulières. Les unes ont les volumes des vésicules de la peau, les autres se rapprochent des bulles par leur grande dimension. L'épaisseur de ces plaques est égale à celle d'une feuille de papier, &c. La salive, sécrétée en abondance, est filante; l'haleine est fétide, mais n'a point l'odeur particulière qui s'exhale de la bouche chez les personnes qui ont abusé des preparations mericurielles." (Traité des Maladies de la Peau, tome i. p. 230.) The most frequent seat of the clusters is the lower part of the thorax; the right side is more frequently attacked than the left: the eruption never appears on both sides at the same time.

Rayer has placed this variety among the bullæ, although he regards it as holding an intermediate place between bullæ and vesicular inflammation.[*] The eruption of shingles appears to be an affection solely of the reticular web of the cuticle, and never extends, like erysipelas, to the subcutaneous cellular tissue.

The premonitory symptoms in shingles are languor, loss of appetite, febrile rigors, headach, a quickened but small pulse, sometimes sickness, pains darting across the chest and epigastrium, and a sensation of scalding heat or deep-seated pain in the spot where the first patches of eruption are likely to appear. In old persons, and in those of delicate habits, this feeling of local heat and pain often continues for a week or more previous to the appearance of the eruption, by the coming out of which it is almost instantly relieved. It is sometimes so severe, that it has been mistaken for pleurisy, and treated by venesection and other depletory means. At other times the precursory fever is so slight, that the first notice which the patient receives of the presence of the disease is a sensation of heat and tingling on some part of the trunk, where he finds on examination patches of shining, pearly, or silvery vesicles, already formed. Sometimes the patches appear at the opposite extremities of the zone, and join by the successive patches extending towards the centre. The vesicles in the separate clusters attain their greatest size, which seldom exceeds that of a pea, in three or four days; and at this time the inflammation of the base of the patch is at its height, of a vivid redness, becoming fainter as it extends beyond the limits of the cluster of vesicles. Generally before the fourth day, while the new clusters begin to appear, the lymph in the first set of vesicles becomes opaque, acquires a milky or yellowish hue, and approaches in some instances almost to the state of pus. The inflammation of the base now changes to a bluish or livid hue, and the vesicles flatten or subside: some, however, break, and either spontaneously or from friction discharge their fluid, which concretes in dark-coloured scabs. These crusts harden and adhere firmly for ten or twelve days, and then fall off, leaving the skin red and tender; and, when the vesicles have been rubbed and become ulcerated, cicatrices or pits sometimes remain. These symptoms vary according to circumstances; thus in old people, or those enfeebled by want, the vesicles enlarge almost into bullæ, break soon, and almost always ulcerate; and even, according to Biett, occasionally have been followed by gangrene. Yet the same physician has never seen the disease attended with much fever or general derangement of the system.

The febrile symptoms which we have observed, generally subsided when the eruption was complete, but not always; and we have seen cases in which the uncomfortable feelings seemed rather augmented than diminished during the whole progress of the eruption; and more especially the deep-seated pain described by Bateman, which, he says, "continues to the latter stages of the disease, and is not easily allayed by anodynes."

Shingles is not a contagious disorder, and may occur several times in the same individual. In the greater number of instances it appears towards the termination of some acute disease. It occurs most frequently in persons between twelve and twenty-five years of age, although occasionally the aged suffer severely from it. Those who have a delicate and irritable skin are most liable to its attacks. It prevails more in summer and autumn than in spring and winter.

It is scarcely possible to mistake shingles for any other vesicular disease, unless in its early stage, when it resembles in some degree herpes *phlyctænodes*; but it may be distinguished by the appearance of the red patches on which new clusters of vesicles are about to appear. The absence of swelling of the skin, and of the disappearance of redness on pressure, readily distinguish it from erysipelas.

The general treatment of shingles is the same as that of the other varieties of herpes *phlyctænodes*, and therefore need not be detailed here. With respect to local applications, a gently stimulant spirituous lotion to the inflamed clusters, to which a portion of tincture of opium may be added when the pain and irritation are severe, may be employed. By these means the vesicles are prevented from breaking; but when this occurs, nothing is so serviceable as the oxide of zinc ointment.

Var. *b*. **Herpes Circinatus.** *Ringworm.*— This variety of herpes *phlyctænodes* is of very frequent occurrence; and being unaccompanied with any constitutional affection, is of little moment. The vesicles are small, and form in a circle, inclosing a portion of the skin seemingly unaffected, while a red inflammatory blush extends to some distance around the cuticle of the circle of vesicles. The fluid contained in the vesicles is generally discharged in a few days; after which dark prominent crusts concrete over them; and at this time the centre, which seemed free from disease, becomes rough and exfoliates.

The eruption of the vesicle is preceded by a red spot of various sizes, from half an inch to two inches in diameter: it is generally circular, but occasionally oval. In a very short time after the redness appears, the vesicles, minute and globular, can be traced by the aid of a glass, filled with a transparent fluid, which becomes opaque before they burst. Sometimes the fluid is absorbed; in which case the vesicles shrink, and exfoliate almost imperceptibly. The period in which each circle runs its course is from eight to ten days; but the circles appear in succession, and as each requires a period of eight or ten days to be perfected and desquamate, the disease is thus protracted to two or three weeks or longer. When the crusts fall off, they leave a redness which remains for some time; but no other inconvenience attends the eruption. In some instances, instead of the regular circle, the whole central spot is covered with minute vesicles, which enlarge sometimes to a considerable size, and are accompanied with much heat, pain, and irritation. When this form of disease occurs, the clusters rapidly spread and pass over the great part of the arms, the places on which this variety generally shows itself. The feverish state does not at once abate after the eruption appears; it contines to increase for five or six days; and about the ninth day the vesicles break, and the fever suddenly ceases.

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[*] Cette maladie forme réellement l'anneau intermédiaire entre les inflammations bulleuses et les inflammations vésiculeuses. Tome i. p. 203.

The vesicular circles most commonly appear on the arms, the shoulders, the chest, the neck, and the face; and in young girls of a delicate frame of body, with a thin and irritable skin, the circles frequently display themselves on the chin.

The disease is very frequent among children, and is commonly but erroneously supposed to be contagious. Its exciting causes are obscure; and it is ushered in merely by a sensation of slight tingling and itching.

This variety of herpes, if it appear on the forehead and at the roots of the hair, may be mistaken for porrigo *scutulata;* but the vesicular character of the eruption, the regular course which it runs, and the hair not falling off, very easily enable us to distinguish it from the contagious ringworm of the scalp, as porrigo scutulata is termed.

No internal treatment is required: lotions containing either of the mineral alkalies, or sulphate of zinc, or alum, may be applied with advantage. Black writing-ink is a domestic application which has proved as beneficial as any that has been suggested.

Var. *c.* **Herpes Labialis.** *Herpes of the Lips.*—This variety differs only in the situation which it occupies. It sometimes extends round the whole mouth, sometimes its seat is the upper, sometimes only the lower lip. When it does not surround the mouth, it is not unusually confined to the angles: wherever it appears it rarely attacks the true lips, but frequently impinges upon the line of union between these and the skin, and at the same time patches of the eruption rise on the cheeks and alæ of the nose. The vesicles, like those of the other varieties, at first contain a transparent lymph, which in twenty-four hours assumes a purulent aspect, and in three or four days becomes more yellow than that usually found in pustules, few crusts forming. The lips, as the disease advances, swell, become hard, sore, stiff, and painful, with a sensation of great heat in the affected parts. After the crusts fall, the surface remains red, harsh, and painful; cracking every time the patient laughs or opens the mouth wider than usual.

Herpes labialis is more decidedly the sequel of a distinct febrile state of the system than any of the other varieties. This febrile state is often of a catarrhal kind, and not unfrequently results from sudden alternations of heat and cold, particularly sudden exposure to damp cold air, after having been confined in a hot or crowded room. The febrile affection is manifested by rigors, headach, pains in the limbs, anorexia, lassitude, and languor. This variety of herpes is often a critical eruption, appearing on the decline of acute diseases, which rapidly disappear as soon as the vesicles, or the inflamed bases on which they rise, show themselves. Severe catarrhs often terminate in this manner; and the appearance of this vesicular disease is considered a favourable symptom in affections of the bowels, and in the latter stages of remittent and low malignant fevers. It occasionally becomes chronic.

In general this variety requires no particular treatment; successive crops of the eruption rarely appearing, so that it runs its course in three or four days, and spontaneously disappears. To allay the heat and itching, diluted alcohol or a solution of zinc proves serviceable. When it becomes chronic, (and in this state it is almost always symptomatic of some deranged state of the digestive organs,) the hydrargyrum cum creta, combined with James's powder in the proportion of ten grains of the former and four of the latter, may be administered every night at bed-time; and during the day the liquor potassæ, in full doses, taken in the decoction of the root of the rumex *acutus* or *obtusifolius*, rarely fails in affording relief. The decoction should be made at first with not more than an ounce of the sliced root to a quart of water, and reduced by boiling to a third; but if the disease do not soon yield, double this strength will be required. The diet should be light, and consist chiefly of milk and farinaceous matters. The diluted ointment of nitrate of mercury is the best topical application in this chronic form of herpes labialis.

Var. *d.* **Herpes præputialis.** *Herpes of the prepuce.*—Although this variety of herpes is not uncommon, yet until Dr. Willan pointed it out as an herpetic eruption, and Bateman accurately described it, it was often confounded with syphilis and treated as such. It more nearly resembles the last variety, herpes labialis, than any of the others. It appears on both the external and internal surface of the prepuce, and not unfrequently on the glans penis. The eruption of vesicles is preceded by a teasing itching and tingling in the prepuce, which appears slightly swollen and inflamed, and covered with two or three red patches, on which, when closely examined, minute vesicles may be observed rising nearly in a circle. These rapidly increase in size; the lymph loses its transparency and assumes a milky hue; and in another day they are coherent and almost pustular. If the vesicles be not disturbed, they sometimes do not break, but the lymph is absorbed, and the shrunk vesicles desquamate; but at other times they break, and form ulcers covered with a whitish fur, and having an elevated base, not unlike the aspect which chancre assumes; and when they are rubbed, or improperly managed by caustic or acrid applications, a tedious state of ulceration sometimes supervenes. When the vesicular patches are situated on the internal surface of the prepuce and on the glans penis, the inflammation is more severe than when the exterior of the organ is the seat of the disease. In some instances the itching and tingling which accompany the eruption are so severe as to prevent sleep. On the exterior, the vesicles terminate about the fifth or sixth day, forming small, hard, acuminated scabs, under which the healing process is carried on; and about the ninth or tenth day the scabs fall and leave the surface slightly indented. In many instances the disease does not run this regular course, but yields to very simple means in forty-eight hours.

This variety of herpes is rarely observed in young men; on the contrary, persons in the decline of life are most subject to it, and it not unfrequently accompanies stricture of the urethra, or an irritable state of this canal. It is also sometimes produced by an acrid state of the secretion at the root of the glans; and we have seen its approach checked by keeping the part between the glans and the prepuce clean with soap and hot water, and afterwards introducing a small piece of clean dry lint to absorb the acrid fluid. Dr. Bateman properly rejects the idea of Mr. Pearson, that it is caused by mercury. The most severe case of the disease which we have seen occurred in a gentleman who had never taken mercury. We cannot, however, agree with the opinion that it is altogether independent of stricture, or at least of irritable urethra: we think that we have also observed it sympathizing with derangements of the chylopoietic viscera. It is more liable to recur than any of the other forms of herpes.

As all these different descriptions of herpetic eruptions are mere varieties of one genus, the general treatment required is nearly the same in all; and this is regulated chiefly by the nature and degree of the fever which precedes and accompanies the eruption. This is seldom so severe as to require the use of the lancet, unless the patient labours under some acute disease of which the herpatic affection may be regarded as symptomatic. More frequently herpes about the mouth and occasionally on the ears occurs as a salutary crisis of fevers, and ought not to be interfered with. If the digestive organs be much deranged, and the eruption can be traced to that source, an emetic will prove useful in clearing away the superabounding acid which generally prevails, and is undoubtedly one cause of the irritation of the intestinal membrane with which the skin sympathizes.

No class of medicines so effectually fulfil the indication to be answered in herpes as mild purgatives, especially those containing magnesia, as they carry off a large portion of the existing acid, whilst the magnesia allays the morbid irritability of the gastric surface. Neither calomel nor any of the very active cathartics are in general required. Diaphoretics are not indicated; and even when much heat of skin exists, more advantage is derived from the free use of diluents than from antimonials or any medicines of that class.

One of the most distressing symptoms in severe cases of shingles is the deep-seated pain which often occurs about the thorax, and when the pulse is at the same time quick and hard, it has, as already stated, led to the supposition that pleurisy is present. The lancet brings no relief in this case; but much comfort is afforded, and sleep secured, by a combination of colchicum, magnesia, and an opiate. The following form is that which we have found most serviceable:

℞ Magnesiæ ℈i.
Vini colchici seminum *m* xlviii.
Tincturæ opii *m* xxx.
Misturæ camphoræ f℥xi. M.
Sit haustus horâ somni sumendus.

In the chronic state of herpes *labialis* the treatment we have already described is commonly successful; but when the disease is obstinate, it is necessary to place the patient under a course of hydrargyrum cum creta, with decoction of sarsaparilla or of elm bark. Upon the whole, although we cannot refuse to accord with the opinions of most writers on affections of the skin, that herpes requires less of the medici diligentia than almost any other of the numerous list of cutaneous eruptions, yet the young practitioner will feel frequent disappointments if he expects all cases of herpes to run so favourable a course. It is only when they are critical of some acute disease that he may altogether disregard them: on the contrary he will sometimes find the most acute suffering precede the eruption, and a degree of general derangement of the system often so obscure as to complicate and restrain the efforts of the physician. In such cases the first object is to gain an accurate knowledge of the state of the stomach and bowels, that of the liver and the chest; and if the nervous system which is often the case, be involved in the general derangement, to ascertain how far this depends on mental causes, as many cases of herpes, in all its varieties, may be clearly traced to grief, anxiety, and other mental sources.

Species 2. HERPES IRIS. — This species differs materially in all its characteristics from the former. It was first announced as a herpetic affection by Dr. Willan, and afterwards accurately described by Bateman. Its usual seat is on the back of the hands; but it has appeared on all parts of the body; most commonly, however, where there is little fleshy substance. It first displays itself in small red spots, which, as they change colour, are surrounded by fresh circles of inflammation, which become vesicular. The patches gradually extend until they attain the size of a shilling, the circumference assuming a radiated or star-like appearance. In the description of Bateman we are told that the first circle, surrounding the central vesicle which is yellowish, "is of a dark or brownish red colour; the second is nearly of the same colour as the centre; the third, which is narrower than the rest, is of a dark red colour; the fourth and outer ring, or areola, does not appear until the seventh, eighth, or ninth day, and is of a light red hue, which is gradually lost in the ordinary colour of the skin." (Bateman's Synop. p. 340.) The variously coloured rings so well defined in this description are, however, rarely observed.

This species of herpes most frequently appears in children and fair women; but neither the predisposing nor the exciting causes are very obvious. Like some of the varieties of herpes *phlyctænodes*, it has occasionally occurred as a critical eruption. In some individuals, according to Bateman, it has recurred several times, "occupying the same parts, and going through its course in the same periods of time."

It is scarcely possible to confound herpes *iris* with any other disease. There is one species of roseola which extends in successive circles, but it wants the vesicles, which are sufficient to characterize the herpetic disease.

With regard to the treatment of this species of herpes little requires to be said: no internal medicines are required; nor do we know any local applications likely to prove serviceable in shortening the disease. The warm bath employed only for twenty minutes, and exercise taken immediately after it, has appeared to be useful. Rayer recommends decoctions of linseed to be employed as fomentations: we have had no experience of their use, so that we are not authorised to give an opinion on the subject. Moderate bloodletting, gentle aperient medicines, and a combination of the solution of arsenic and of pure potassa, with the decoction of the rumex obtusifolius, have been productive of more benefit than any other means which we have employed. A small piece of soap-plaster laid over the parts affected, has occasionally been productive of much benefit.

[It may be proper to add, that in regard to the local treatment of the different varieties of herpes, difference of opinion has existed. Whilst some restrict it to washing the parts with tepid milk and water, or with mucilage, others recommend oleaginous and other applications, possessed more or less of astringent or excitant properties. Chlorinated lime; chlorine; hydrocyanic acid; creasote, in solution or ointment; soot; cyanuret of mercury; red iodide of mercury; tincture of iodine pencilled over the parts, especially in herpes circinatus; iodide of potassium; cod-liver oil, used externally and internally, have all been employed. Very obstinate cases may require, also, the internal use of the preparations of iodine, combined with syrup, to modify the condition of the circulating fluid, and through it that of the system of nutrition.

It has been recommended to open the vesicles early, and apply an emollient catiplasm over them; and it is affirmed, that in herpes *zoster*, where the pain is very severe, the best effects result from the application of a dozen leeches to the inflamed part. If done early, before many vesicles have appeared, the farther progress of the disease, according to Dr. Mackintosh, (*Principles of Pathology and Practice of Physic*, 2d Amer, edit. ii. 286, Philad. 1837,) may be stopped. Small blisters, applied to the inflamed skin, in the vicinity of the vesicles, it is said, check their extension, and produce a shrivelling of those already formed.]

A. T. THOMSON.

HICCUP.—Hiccup or *hickup*, sometimes written *hiccough*, apparently from a mistaken notion of the etymology of the word. It may have been immediately derived to us from the Danish; but its origin in that as well as in some other languages was most probably an attempt to imitate the peculiar sound which it denotes. It corresponds with the French *hoquet*, and the German *schlucken;* but the Greek λὺγξ or λυγμὸς, and the Latin *singultus*, though applied to this affection, seem also to have designated the somewhat analogous one which we call *sobbing*.

The phenomena of hiccup, as observed by a by-stander, may be described to consist in a sudden, rapid, and brief inspiration (such as may properly be called convulsive), instantly followed by expiration; each of these movements being accompanied by a noise not heard in common respiration, and these noises following each other in quick succession, produce that peculiar dissyllabic sound by which the affection is characterized. The convulsive movements return at short intervals, commonly varying from half a minute to a minute, but sometimes of longer duration, and are attended by an uneasy sensation at the præcordia, which, when the hiccup is violent and often repeated, amounts even to pain.

Such are the phenomena presented by this affection, apart from any attempt to explain its *mechanism*. What this is has been the subject of much conjecture. The oldest opinion seems to have been that it consisted in a convulsive movement of the stomach; an opinion which, in the then very imperfect state of physiology, was not an unnatural inference from the well-known fact that the exciting cause is commonly some impression directly made upon that organ. Since, however, the functions of the stomach and neighbouring parts have been more accurately investigated, most authors have concurred in referring the motions which constitute hiccup chiefly to the muscles employed in respiration, and particularly to the diaphragm. That causes acting upon the stomach are adequate to excite these muscles to violent and irregular contractions is familiarly known. Fits of coughing (especially in the hooping-cough) and of spasmodic asthma are often produced in this way; and whatever difference of opinion may still exist as to the particular combination of muscular actions by which vomiting is effected, it can scarcely be doubtful, especially since the experiments of Magendie, that the expulsion of the contents of the stomach is ordinarily in great measure produced by the agency of some of the respiratory muscles. If, however, two phenomena, so widely differing in their results as vomiting and hiccup, are referred chiefly to the same mechanical powers, some other cause of their difference must exist. It is probably owing to an inverted action of the muscular fibres of the stomach and gullet co-operating with the other agents in the former, and not in the latter, that the rejection of the contents of the stomach takes place in the one, but does not happen in the other.

The modern opinion, which ascribes hiccup chiefly to the respiratory muscles, rests upon the following among other arguments.—1. The phenomena of the affection, as above described, appear to consist chiefly in a convulsive act of respiration. 2. The researches of physiologists have clearly shown that the muscles in question, or at least some of them, are capable of movements corresponding with those of hiccup in rapidity and violence. 3. We are without any satisfactory evidence that such motions are ever performed by the muscular fibres of the stomach. 4. A consideration of two popular methods of preventing the recurrence of hiccup, namely, holding in the breath for a considerable time, and making a protracted deglutition by sipping liquids; both of which seem to owe their efficacy to the power of the will over the respiratory muscles.

Some writers, while they admit the agency of the diaphragm in producing hiccup, have supposed the œsophagus to co-operate with it. Thus Mahon (Encyclopédie Méthodique) explains the affection as consisting in "a convulsive movement of the œsophagus, which draws the stomach and diaphragm upwards, whilst at the same time the diaphragm itself experiences a convulsion which draws it downwards."* It is, however, very questionable whether the œsophagus ever executes movements of the kind here supposed. With regard to the peculiar noise which accompanies hiccup, there can be little doubt that it is caused by a convulsive or spasmodic action of the muscles about the glottis.

There are two convulsive affections which, without being absolutely identical with ordinary hiccup, so nearly resemble it, that they are designated by the same word, at least in some languages, and must apparently be referred to nearly the same muscular powers. Thus, what is properly called the *hiccup of death*, although owing its name to a similarity to the true hiccup, in some respects differs from it. According to Double, it consists of two quick and forcible inspirations preceding a feeble and protracted expiration. The affection which we call *sobbing* is so analogous to hiccup, that, as has been before observed, the Greeks and Romans designated both by the same words. Indeed, not only do they nearly resemble one another, but sobbing in children often passes into perfect hiccup.

Having considered the mechanism of the affection, we may next advert to its *causes*, and the circumstances under which it occurs. In relation to these points, all the cases which are met with may be referred to two general heads, according as the hiccup is or is not preceded or accompanied by some other recognised morbid affection, of which it may be considered a symptom or consequence. It will be convenient to designate these two divisions by the terms symptomatic and idiopathic, although the strict propriety of such words is questionable.

By far the most frequent cause of *idiopathic hiccup* is some impression directly made upon the stomach; as, for example, by very hot or highly seasoned food, especially in a liquid form; by alcoholic and other stimulant liquors; and by food swallowed hastily, or in two great quantity, especially after long fasting. As the affection, when produced by causes of this kind, generally occurs almost immediately after the irritating matter is taken into the stomach, it may be reasonably inferred that the impression upon that organ, which calls forth the muscular efforts by which the hiccup is affected, is chiefly made upon its cardiac extremity; and we shall hereafter see that one mode of explaining the final cause of the affection is by a deduction from this opinion.

The occasional causes just enumerated evidently act upon the sensibility of the lining membrane of the stomach; but there are others which seem to operate by a mechanical impulse communicated to the whole organ. Thus, in children more particularly, any vehement or convulsive movement of the respiratory muscles, as violent crying and sobbing, or a fit of coughing, is apt to end in hiccup. The same occasionally happens with vomiting, as was observed by Hippocrates, who noted it as an unfavourable occurrence.

A cause of a very different description from the above is fasting. It implies a prolonged absence of the proper and accustomed stimulus of the stomach; and the influence of this negative impression seems to afford a more probable explanation of the occurrence than the hypothesis which has referred it to the supposed irritation of the gastric juice.

Idiopathic hiccup, though generally, is by no means exclusively produced by causes directly influencing the stomach, emotions of the mind, copious evacuations, as bleeding and purging; cold applied to the surface of the body, as the epigastrium, feet, &c.; and in fact, where there is a predisposition to it, almost any impression, external or internal, may call it forth. John Hunter observes that it often accompanies local irritation after operations of various kinds. To inquire whether such causes determine the muscular movements by which hiccup is effected, through the medium of an intervening impression upon the stomach, would be a fruitless indulgence in speculation.

The tendency of occasional causes, of whatever kind, to induce this affection, is of course very much dependent upon the degree of predisposition in the individual. This may perhaps be stated in general terms to arise from the same circumstances as those which appear to favour the occurrence of other convulsive movements, and especially from that condition of the system which is expressed by the common but indefinite terms of debility and irritability, or mobility. Thus it is familiar that childhood and old age are more liable to the affection than the middle periods of life; and that the female sex, especially in the puerperal state, is more subject to it than the male. There seems, however, to be ground for a more definite view of the matter, and for referring the predisposition, at least, in a majority of cases, to a preternatural sensibility of the stomach, or to a tendency in that organ to functional derangement. Such a condition or tendency is well known to exist in the earlier and later periods of life, and during gestation; and it is probably owing to its presence in an unusual degree that, in some individuals, even a moderate quantity of the mildest food will often cause a fit of hiccup. Indeed in such persons it not unfrequently occurs without the intervention of any known cause.

The predisposition, in whatever it consists, may be either original or acquired. In the latter case it can sometimes be traced to debilitating circumstances, as excessive evacuations; but it is much more commonly attributable to causes which directly impair the digestive powers, as the abuse of ardent spirits, excesses in diet, &c.; and such an impaired state of the function of digestion is probably one principal cause of the peculiar liability of old people.

Idiopathic hiccup is commonly too slight and transient an affection to merit the name of disease. Sometimes, however, by its violence, but more often by its duration, it assumes a graver character, and has even appeared to be fatal, as will be more particularly stated when the terminations of the affection come to be considered. It has occasionally been observed to recur periodically, at regular intervals, as, for example, annually, and at the same period of the year. Thus Heberden speaks of cases, some of them unaccompanied by any other appreciable morbid affection, in which it lasted for many months, and even for years, being in some constant, in others intermitting. Dr. Good also refers to cases in which it returned at irregular intervals, for periods of from four to twenty-four years; in others in which it continued incessant, or nearly so, for eight and twelve days, and even three months.

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* "Un mouvement convulsif de l'œsophage, qui tire en haut l'estomach et le diaphragme, tandis qu'en même tems le diaphragme lui-même éprouve une convulsion qui le tire en bas."

The second division of cases of hiccup includes those in which it co-exists with, and appears to depend on, some other disease as its cause: being then what we call a *symptomatic* affection. It has been noted by authors as occurring principally in the following diseases:—fevers, both continued and intermitting, especially the latter; a complication which seems to have been formerly not uncommon, as the epithet *singultuosa* was applied to fevers accompanied by hiccup throughout their course; inflammation of the stomach, bowels, and liver; peritonitis, perhaps more particularly when the peritoneal coat of the diaphragm is involved; strangulated hernia; irritation of the mucous membrane of the alimentary canal, including worms, dentition, and the operation of poisons; disorders of the digestive function generally, especially when attended by the acid eructations which cause heart-burn; jaundice; uterine irritation, whether connected with gestation or not. Thus severe and protracted hiccup has been sometimes observed as one of the attendants of hysteria. It is also enumerated by some authors among the symptoms of inflammation of the spinal cord or its membranes; and Heberden states that it sometimes accompanies paralysis, and precedes epileptic fits. Of more uncommon instances, one deserves to be mentioned, because the hiccup is said to have been fatal. It is a case related by Bobe-Moreau, and cited by De Lens, (Art. *Hoquet*, Dict. des Sc. Méd.) in which a severe hiccup accompanied an abscess in the upper part of the pharynx: and the death of the patient is ascribed to the symptomatic rather than to the primary affection. Some accidents affecting the diaphragm and neighbouring parts are also stated to be more or less commonly followed by hiccup: such are penetrating wounds of the abdomen, the passage of any of the abdominal viscera through the diaphragm into the thorax, fracture of the ribs, and depression of the ensiform cartilage.

As the most frequent cause of idiopathic hiccup is some direct irritation of the gastric mucous membrane, so by far the most common morbid affection on which the symptomatic variety depends, is functional or organic derangement of the stomach, and of those organs which are associated with it in the digestive process; a derangement of which habitual excess, particularly in the use of ardent spirits, is undoubtedly the principal origin. With regard to the mode in which the other diseases and accidents above enumerated give rise to hiccup, we seem to have no adequate data on which to reason, and mere speculation would be worse than useless. It will, however, be seen that most of them either directly involve the digestive organs, or others which are known to have a close sympathy with them. The occurrence of hiccup in some of these cases can scarcely be accounted for except by supposing a considerable predisposition to exist; and the same may be said of its appearance under certain circumstances in which it is not strictly referrable either to the symptomatic or idiopathic form, but immediately follows the disappearance of some previously existing disease. The most common case of this kind is the sudden cessation of ague, of which numerous examples are found in the older writers. Among others, Fred. Hoffmann mentions instances in which the hiccup assumed both a continuous and periodical form. It has also been observed to ensue upon the disappearance of continued fever, gout, rheumatism, and cutaneous diseases, and upon the cessation of a natural or accidental evacuation, as the menses, hemorrhoids, and diarrhœa. When originating in this way, it is sometimes very tedious and obstinate; as, for example, when connected with amenorrhœa, not ceasing till the menstrual evacuation is re-established.

Among the circumstances which determine the occurrence, or rather the continuance of hiccup, we must include the force of habit. The influence of this cause is seen in most if not all of the convulsive movements to which the body is liable; and in none more so than in the one now under consideration.

Of the *terminations* of this affection little need be said. When unconnected with any other severe malady, it almost invariably disappears sooner or later, though its duration is, as we have seen, sometimes very protracted. Cases are, however, reported to have occurred, in which the hiccup itself was the cause of death. One has been already adverted to, in which it was symptomatic. The same author (Bobe-Moreau) relates another, also complicated with difficult deglutition, and speedily fatal; but no cause of the hiccup was discovered by dissection; nor have we any thing beyond conjecture to explain the fatal termination. De Lens, apparently following some preceding authority, states that prolonged hiccup produces swelling and redness of the face; thus implying the possible occurrence of cerebral congestion or of suffocation.

It has been before stated that hiccup sometimes follows and takes the place of other convulsive movements, in the production of which the respiratory muscles are chiefly concerned, In like manner it occasionally terminates in them. The most common instances appears to be that of sneezing: thus Hippocrates says, if hiccup be restrained, sneezing comes on, and the hiccup ceases; and Lanzoni and Bartholin met with hiccup alternating with violent sneezing after tertian ague.

Having thus mentioned most of the facts relating to this affection which seem worthy of notice, it will be proper to make a few remarks on what may be called its final cause. In many of the convulsive movements of the body, such as coughing, sneezing, and vomiting, this is in general sufficiently obvious, being either the expulsion of offending matter, or the protection of the irritated part by exciting secretion, or the restoration of its interrupted circulation and functions. In others, as epilepsy and often asthma, the existence of such a cause, though not admitting of demonstration, seems deducible from a just analogy; and the same may be said of hiccup, at least when excited by some direct irritation of the stomach. In such cases, the final cause is evidently not the rejection of the offending matter; for this would be effected by the act of vomiting, which hiccup has little or no tendency to induce. It is conceivable that one end to which it is directed is the propulsion of the irritating matter towards the duodenum; and thus the final cause has been conjectured to be the removal of such matter from the cardiac extremity to a less sensitive part of the stomach. However this may be, it seems probable that the hiccup subserves another and perhaps more important purpose,—that of determining so much of vital energy to the organs of digestion, especially the stomach, as shall counteract the morbid influence exerted upon them, and induce a vigorous performance of their functions. Such a view well accords with that pleasurable sensation, referred to the epigastric region, which is stated often to follow a fit of hiccup. The same may be said of a fact already mentioned, the occurrence of hiccup as a termination (sometimes apparently a critical one) of continued and intermittent fevers, and also of its occasional appearance at the commencement of eruptive fevers. To these may be added another, mentioned in the first report made by Drs. Russell and Barry, on the cholera at St. Petersburgh. These gentlemen observe it is "singular enough to say, hiccough coming on in the intermediate moments between the threatening of death and the beginning of reaction, is a favourable sign, and generally announces the return of circulation."

Undoubtedly the above view of the final cause is most obviously applicable to those cases in which the hiccup appears as the effect and remedy of a temporary irritation; but it is by no means incongruous with others in which the affection is symptomatic of some grave or fatal lesion. The parts of our frame are so associated by that inexplicable bond which we call sympathy, that irritation in one organ commonly gives rise to a morbid condition or movement in others. This association is governed by certain general laws, often very imperfectly known to us, but the great end of which is manifestly the preservation of the whole body; and the operation of these laws continues, not only when it cannot produce any beneficial effect, but even when it becomes absolutely pernicious. Thus the hiccup which ushers in death is a fruitless effort of nature; while that which results from abdominal wounds, inflammation, or herniæ, may not only be inadequate to accomplish any good purpose, but may even aggravate the existing evil by a repeated concussion of parts which stand in need of perfect rest.

In relation to **diagnosis** generally, the presence or absence of hiccup does not appear to be a guide of much value, since it is pathognomonic of no one morbid affection, but appears under widely different circumstances, from an inconsiderable and temporary irritation to the most formidable and fatal lesions. In cases which present general indications of severe abdominal disease, but not such as enable us to localize it, hiccup may indeed point to some two or three organs more particularly, but it cannot justify us in allocating the disease in any one of them rather than in the others.

As a ground of **prognosis** it may be more valuable; though, for the reasons just stated, scarcely so much so as has been generally represented. Conjoined with other symptoms which portend death, it of course strengthens the evidence of its approach; and when it occurs in affections which have produced great prostration of the vital powers, it no doubt generally implies an expiring and ineffectual struggle of nature. Thus Hippocrates speaks of it as an alarming symptom after hemorrhage, vomiting and purging; and Sydenham appears to have verified the observation, especially with reference to the aged. It is, however, to be borne in mind that even in such circumstances it sometimes indicates (as already stated of cholera) a successful effort of nature to bring about a salutary reaction.

It is not necessary to say much about the **treatment** of an affection which is mostly either too inconsiderable and temporary to call for medical aid, or else a mere symptom of some more formidable malady. In the slighter cases of idiopathic hiccup in which its recurrence seems chiefly the effect of habit, impressions of various kinds, made either upon the organs more immediately concerned, or upon the body generally, are adequate to remove it. Such are the emotions of surprise and fear, a forcible suspension of the act of respiration, sneezing, vomiting, protracted deglutition by sipping liquids, the administration of what are called antispasmodic medicines, including opium; of stimulants, as oil of anise, mint, &c.; of mineral acids, alkalies, and bitter tonics, especially quinine; cold aspersion of the body, &c. The efficacy of many of these remedies is no doubt partly or principally owing to their removing those disorders of the digestive function of which hiccup is so often a symptom.

In cases of a more severe or obstinate nature, cupping at the epigastric region, the application of blisters, sinapisms, and warm plasters to the same parts, and opiate friction, have been resorted to with success. Borrichius relates a case in which the affection returned annually at the same period, and each time yielded to a copious bleeding; a fact which illustrates the remark of Hippocrates, that hiccup, like spasm, may result from repletion (πλήρωσις), as well as evacuation (κένωσις)· When it depends upon causes of the latter class, opium is undoubtedly, as Sydenham has told us, the best remedy; and the same may be said of those cases of visceral disease or lesion, in which, supposing recovery to be hopeless, we must still attempt to remove, or at least to mitigate, a distressing symptom.

Edward Ash.

[**HOMŒOPATHY.** (See Disease.)]

HOOPING-COUGH.—Hooping-cough has been described under a variety of names, many of which, as chin-cough, kink-cough, &c. refer to its prominent symptom. In France it is usually termed *coqueluche*; in Germany, *keuchhusten*, *stickhusten*, &c.; in Scotland, *kinkhoast*. It was called tussis convulsiva by Willis, tussis ferina by Hoffman.

The nosological term at present most generally employed to express the disease is *pertussis*, first given to it by Sydenham, and afterwards adopted by Cullen, who arranges it under the class Neurosis, order Spasmi. His definition of the disease is the following:—"Morbus contagiosus, tussis convulsiva, strangulans, cum inspiratione sonora, iterata, sæpe vomitus."

In the above definition may be found Cullen's opinion as to the contagious nature of the disease. Doubts have, however, been raised upon this point by Laennec, Desruelles, and others, though not supported in such a way as to invalidate the common notions upon the subject.

The disease appears to have two distinct stages. The first lasts generally from ten days to a fortnight, or even three weeks, and is not different from an ordinary catarrh; there is cough and coryza often with very little fever. At the end of a period varying from one to two or three weeks, the second stage commences, and is distinguished by the peculiar convulsive cough. In this cough a number of expirations are made with such violence, and repeated in such a quick succession, that the patient seems to be almost in danger of suffocation. The face and neck are swollen and livid, the eyes protruded and full of tears; at length one or two inspirations are made with similar violence, and by them the peculiar *whooping* sound is produced: a little rest probably follows, and is succeeded by another fit of coughing and another whoop; until, after a succession of these actions, the paroxysm is terminated by vomiting, or a discharge of mucus from the lungs, or perhaps by both. [In very young children, as properly remarked by M. Constant (*Gazette Médicale,* 1836, p. 53,) the expectoration is an important element of diagnosis, as it is the only affection at an early age in which it is met with. (Bell, art. *Coqueluche,* in Dict. des Etudes Médicales, Paris, 1839.)] Sometimes when the *kink* is unusually severe, blood is forced from the nose, ears, and even from the eye-lids; and occasionally it ends, without producing any discharge, in the complete exhaustion of the patient.

The number of paroxysms occurring during a day varies much in different cases, according to the severity of the disease; and the violence of each is diminished in proportion to the freeness of the expectoration. After the disease has continued at its height for two or three weeks, it begins naturally to decline; the paroxysms become less frequent and violent, the expectoration increases, the cough soon loses its peculiar characteristics, and finally wears away altogether, leaving the patient in perfect health. It is to be observed, however, that occasionally, several weeks after the cough has entirely subsided, it may return; and for a long time, if the patient accidentally catch cold, the cough will often assume the spasmodic character, and be accompanied with the "whoop."

We may safely assert, notwithstanding a contrary surmise advanced by some of the French writers, that hooping-cough rarely if ever affects the same individual twice; and as its usual period of occurrence is during childhood, we shall of course seldom meet the disease among adults.

It is also supposed to be very uncommon in early infancy (for the first two months)—an opinion which is generally true, although we have seen more than one instance of an attack in children three weeks old. When the disease attacks an adult, it generally wants the peculiar whooping inspiration, and the same thing is usually, but not constantly, observed in the cases of very young children.

Nature and seat.—A great variety of opinions have been advanced by different authors respecting the nature of hooping-cough; all, however, that have any bearing on practice may be reduced to the three following:—

1. It was considered to be essentially spasmodic, and to arise from irritation affecting either the brain or some parts of the nervous system, a theory advanced and variously modified by Cullen, Leroy, Löbenstein, Jahn, and Webster.

Dr. Webster's opinion is "that the actual seat of hooping-cough is in the head, and that the affection of the respiratory organs is only to be considered as the secondary effect, or as an effort of nature to relieve herself by expanding the lungs to an unusual degree, and thereby allowing a greater quantity of blood to flow into them, which may in some degree diminish the fulness and congestion in the head." (Med. and Phys. Journal, Dec. 1822.)

Löbenstein and Breschet favoured the idea of the disease having its origin in the phrenic and pneumogastric nerves.

2. A great number of celebrated names may be enumerated in support of the opinion that it is always an inflammatory affection of the bronchial membrane; amongst these are Guersent, Watt, Marcus, Laennec, Dewees, &c.

As the attention of Dr. Watt was particularly directed to hooping-cough attended with bronchial inflammation, in consequence of the death of two of his children from this cause, we shall here give an abstract of his general conclusions on the subject. According to him, "it is in all cases an inflammatory disease of the mucous membrane of the larynx, trachea, bronchi, and air-cells;" and when mild, he says, it may run its course without materially disturbing the other functions of the body, or even the functions of that very membrane where it is seated; and that, whenever it proves dangerous or fatal, it does so by the degree of inflammation in the natural seat of the disease, or by that inflammation extending or being translated to other parts. (Treatise of Chincough, Glasg. 1815.) Dr. Dawson differs from the other writers who support the inflammatory origin of hooping-cough, in confining its first seat to the membrane of the larynx, or, strictly speaking, of the glottis. (Nosological Practice of Physic, London, 1824.)

3. Some consider the disease to be at first inflammatory, afterwards spasmodic. Desruelles advanced this opinion, and proposes to designate hooping-cough by the term "broncho-cephalite." According to him the disease consists of an inflammation of the bronchi complicated with irritation of the brain, the bronchitis being always primitive, the cerebral irritation always consecutive. So long as the bronchitis is simple, the cough has nothing peculiar; but as soon as the cerebral irritation occurs, the diaphragm and respiratory muscles, and those of the glottis and larynx, are drawn into spasmodic action, and the cough changes its character and becomes convulsive.

This theory has the great recommendation of being in accordance with the practice which is found most beneficial in the treatment of the disease; and it has been justly remarked that the effects of remedies, if accurately observed, are like chemical tests, frequently the means of detecting important differences in objects which otherwise could not have been distinguished from each other.

Amongst so many different opinions respecting the nature of the disease, and the sources from which danger most frequently arises, the young practitioner is left without any steady guide to regulate either his prognosis or his practice.

There can be little doubt that much of this confusion has arisen from the attention of practitioners having been directed so particularly to certain complications as to lead them to overlook the simple disease itself. In order to avoid this error, and to give (as it is hoped) a clearer view of the subject, we shall consider hooping-cough under the four following divisions:—

1. Simple hooping-cough.
2. Hooping-cough complicated with bronchitis or peripneumony.
3. Hooping-cough complicated with disordered bowels or infantile remittent fever.
4. Hooping-cough complicated with convulsions or hydrocephalus.

1. *Simple Hooping-cough.*—The disease may be called *simple*, where after it is fully formed, the fits are neither frequent nor violent, the expectoration is moderate, and the child during the intervals of the cough is quiet, retains his appetite, sleeps well and without fever or difficulty of breathing. A child will be playing apparently in good health, when suddenly he drops his playthings, rushes out of the room, and is heard to cough, whoop, and discharge the contents of his stomach; immediately after which he returns calling out loudly for something to eat. In a few minutes after the paroxysm, his pulse will be quite tranquil; and if the stethoscope be applied to the chest, the respiration will be heard perfectly natural, without any mixture of wheezing.

In such a case the disease must be considered almost, if not altogether, free from danger, and it is scarcely reasonable to suppose the existence of bronchial inflammation.

It may be said that cases of this description are rarely to be met with, and this must be admitted; but if children always lived in pure air, and were in perfect health when attacked by the disease, and if it occurred during the summer season, such cases would be much more frequent.

As this combination of favourable circumstances, however, rarely occurs, so we seldom meet the disease in this simple form; but its occurrence even in a single instance decides the question that the disease, in the second stage at least, is not necessarily inflammatory, as we can hardly presume an inflammation to exist without any symptoms of inflammation being present.

2. *Hooping-cough complicated with Bronchitis or Peripneumony.*—The symptoms of this complication, though sometimes obscure, are generally well marked. According to Cullen, hooping-cough hardly ever proves fatal without considerable dyspnœa having existed for some time. It would appear that in older children, when the disease proves fatal, it is most commonly in consequence of inflammation supervening in the mucous membrane of the lungs. In very many instances where the state of the lungs was ascertained by dissection, the most remarkable phenomenon that presented itself was an inflamed condition of the bronchi, which were almost entirely plugged up with frothy mucus and sero-purulent fluid.

[Of thirty-eight cases of complications, reported by M. Blache, (*Archiv. Général. de Médecine*, 1833, tome 3,) twelve were of pneumonia; and of twenty-eight cases, observed by M. Constant, in the *Hôpital des Enfans* of Paris, ten were of the same affection. (*Gazette Medicale*, 1836, p. 528.)]

A point of the greatest importance in the treatment of the disease is to watch the earliest symptoms of bronchitis, as upon their speedy removal will principally depend the safety of the patient.

We are warned of the occurrence of bronchitis when the pulse becomes permanently quick, small, and hard; the fits of coughing become more frequent and more distressing, and the breathing is hurried in the intervals of the paroxysms; when any exertion or speaking causes increased difficulty of breathing or panting; the lips acquire a livid hue, and the extremities show a great tendency to become cold.

As the disease advances, the pulse becomes more frequent, the difficulty of breathing increases, the alæ nasi are alternately contracted and dilated, and there is great prostration of strength; in many cases the cough is nearly suspended, and when it does occur, it is not accompanied by the usual whoop, and the difficulty of getting up the mucus is greatly increased.

The respirations vary from 60 to 100 in a minute; and if, after having maintained this frequency for twenty-four or thirty-six hours, they come down to 40 or 50, the change generally indicates recovery.

There is considerable and permanent wheezing for the two first days, not audible unless by aid of the stethoscope or by applying the ear to the chest, after which it increases and becomes quite perceptible by laying one hand on the chest and the other on the back. The wheezing is greatest after sleep, or immediately before a paroxysm of coughing.

When the bronchial inflammation cannot be checked, the breathing becomes more hurried and laboured; the wheezing increases; stupor and prostration succeed; the cough is suspended; the pulse becomes nearly imperceptible; the extremities cold; and in the course of eight or ten days from its commencement death ensues from the accumulation of mucus, which apparently produces suffocation.

When the attack terminates favourably, the breathing becomes less hurried, the wheezing diminishes, the cough after a temporary suspension returns, the fever subsides, the countenance assumes a more healthy appearance, and quiet sleep succeeds to distressing restlessness.

On examination after death, the most usual morbid appearance is inflammation of the mucous membrane. The lungs collapse imperfectly, and when cut into, an abundance of frothy and puri form mucus exudes from the bronchi and air-cells. Increased solidity of the lung has often been found, and by some it is said to be constantly observable. When it does occur, it would appear that the inflammation had extended from the mucous membrane to the substance of the lung, or attacked both its textures.

3. *Hooping-cough complicated with disordered Bowels or Infantile Remittent Fever.*—These, though present, are much less formidable combinations than the last, but still they render the disease very intractable.

If we find a child in this disease breathing heavily, with foul tongue, loss of appetite, tumefied belly, and the discharges from the bowels unnatural in colour, consistence, or smell, we may rest assured that, unless these symptoms are removed by the prompt use of medicine calculated to effect that purpose, much distress will eventually ensue. Infantile remittent fever will next arise, and this may itself prove fatal, or lead to hydrocephalus.

A great number of the long-protracted cases of hooping-cough are complicated with remittent fever. After the symptoms just enumerated have continued for a longer or shorter time, the fever makes its appearance, sometimes commencing with a rigor; more frequently, however, it comes on so gradually, that we do not know precisely when to date its commencement. The paroxysms of coughing become more frequent, and the breathing is quickened and oppressed; but still it may be with a little care distinguished from the attack of bronchial inflammation. The stethoscope affords us useful though negative evidence. The usual symptoms of bronchial inflammation are absent. The frequency and force of the respiration are found increased, but this increase is not accompanied by any râle indicative of bronchial inflammation; while the daily remissions, the loaded tongue, the nature of the alvine discharges, the aspect of the child constantly picking his nose and lips, all serve to determine the true character of the disease.

4. *Hooping-cough complicated with Convulsions or Hydrocephalus.*—Every one who has seen much of hooping-cough is aware that when it occurs during the period of dentition, it is frequently accompanied by convulsions, and that they were among the principal sources of danger at that age.

This complication may be accounted for in like manner as the bleeding from the nose, ears, &c.—namely, by the interruption given by the violence of the cough to the free return of blood from the head, and also by the circumstance of children being so liable to convulsions at this period of their lives.

It is said that the child may be carried off by one of the convulsions: this, however, very rarely happens. After their frequent return, the case may pass into hydrocephalus.

In a child from seven months to two years of age who has the hooping-cough, if we observe that the paroxysms become suddenly increased in violence, that the thumbs are drawn into the palms of the hands, while there is no accession of bronchial inflammation to account for the increase of cough, we may apprehend convulsions. If, however, in addition to these symptoms, the child, after each fit of coughing, instead of whooping becomes livid, we may calculate to a certainty on convulsions, if suitable means be not employed to ward them off. If the child has ever had the swelling of the top of the fingers and toes, noticed by Dr. Kellie of Leith, or that peculiar spasmodic affection described by Dr. Clarke and more recently by Dr. Marsh, under the title of Spasm of the Glottis, (see GLOTTIS, SPASM OF,) we can scarcely expect that it will pass through the hooping-cough without an attack of convulsions.

It is sometimes important and always desirable to be able to say if the convulsions in these cases depend upon disease in the head; and rules have been laid down for ascertaining this point, but they are not altogether unobjectionable. It is said, that in hydrocephalus one side of the body is more affected than the other, but in convulsions which are independent of organic disease of the brain, that both sides are equally affected. If the convulsions are distinctly confined to one side of the body, there is every reason to fear the existence of hydrocephalus; but it certainly does not follow, because the convulsions are general, that the brain is unaffected. In the latter case we must wait until the convulsions subside before we can discover their cause, and then we must form our opinion from the general state of the child and the history of the case, rather than from any peculiarity in the convulsion itself.

When hydrocephalus supervenes upon hooping-cough in a child under two years of age, it is almost uniformly preceded or accompanied by convulsions; occasionally, however, it creeps on more insidiously, and we have several times been called upon to see a child in a state of stupor, with one arm sawing the air, whilst the other side was paralysed; and yet neither the parents nor medical attendant were aware of the nature of the case, but were solely occupied in attending to the cough.

Where hydrocephalus prevails in the family, we must, whenever the children are attacked by hooping-cough, be on the look-out for the earliest symptoms. If there are fits of drowsiness and languor, aversion to light or noise, occasional headach, screaming out during sleep, grinding the teeth, frequent sighing; after more or fewer of these symptoms, if the child is attacked with fever, accompanied by greater irritability of stomach than we can account for or than is natural in hooping-cough, and if, to use the words of Dr. Cheyne, "purgatives produce mucous rather than feculent stools," we may safely consider that our most strenuous exertions will be required for the averting of this formidable malady.

The approach of hydrocephalus in these cases has been occasionally overlooked in consequence of mistaking the laborious respiration arising from oppressed brain, and considering it to be the effect of bronchial inflammation. The assistance of the stethoscope would be here most valuable, but unfortunately the restlessness and crying of young children renders its application in many cases difficult if not altogether impossible, and we are often obliged to form our opinion from the character of the breathing. In hydrocephalus the breathing is not permanently quick; it is irregular and sobbing; occasionally the child sighs heavily expanding the chest in a manner that never takes place in inflammatory affections of that cavity.

[*Causes.* — Of the causes of hooping-cough, as of every other epidemic disease, we know but little. It occurs sporadically, and often epidemically, and prevails at all seasons, and in all climates, attacking every age and condition; but children under the age of the second dentition are most liable to it. It is generally considered to be contagious; (M. Blache, art. *Coqueluche,* in *Dict. de Méd.* tom. ix. Paris, 1835,) and the writer is rather disposed to be of this opinion, although he finds it difficult to come to any positive conclusion on the subject, (*Practice of Medicine,* 2d edit. i. 281, Philad. 1844,) and such appears to be the case with others, (Rilliet & Barthez, *Traité des Maladies des Enfants,* ii. 231, Paris, 1843.]

Prognosis. — It is generally supposed that hooping-cough is more dangerous in proportion to the youth of the child, and it is certainly true that the majority of its victims are under two years of age. It is, however, equally true, that a healthy child under six months, who has a good nurse, will get through the disease better than one a few months older, who has been recently weaned, or in whom dentition has commenced. The following circumstances would lead us to give a favourable prognosis: dentition being completed, and the head, bowels, and lungs not being subject to determinations or irritations; the season of the year being mild and dry; the patient not suffering or not having recently suffered from any other of the diseases of childhood, and having a sound, healthy constitution; finally, the accessions being at long intervals, the remissions complete, and the night, during which the *symptoms are usually most severe*, well spent. In adults, owing to their greater strength of constitution, and lesser liability to the diseases which usually produce a fatal result in hooping-cough, the prognosis will be more favourable.

[When hooping-cough prevails extensively, the mortality is occasionally considerable. In Glasgow, according to Dr. Watt, (*Treatise on the Nature &c. of Chincough,* Glasgow, 1813,) the deaths were pretty nearly 5½ per cent. of the whole number; and in one year, they amounted to 11½ per cent.]

General Treatment. — The treatment of hooping-cough has always been considered as difficult; indeed, it is generally admitted that, even in the mildest form, it will run its course without *much* interruption or abbreviation from medicine. From this consideration it would appear that in the *simple* hooping-cough very little medical interference is required; and judicious practitioners content themselves with giving every night a few grains of rhubarb and ipecacuan proportioned to the age of the patient, with an occasional emetic; confining the child to a milk and vegetable diet, and, during the existence of the catarrhal symptoms, to an equable temperature. The latter advice leads us to speak of the popular error, too often countenanced by practitioners, of unguardedly exposing the child to cold and open air. We shall shortly find that change of air is often very beneficial in a later stage: but when the first or catarrhal stage exists, we should adopt the practice now recommended. Mr. Pearson's plan of treatment is applicable to the simple disease. He prescribes in the first instance an antimonial emetic, and afterwards, for a child of one or two years old, a draught containing a drop of tincture of opium, five drops of ipecacuan wine, and two grains carbonate of soda, to be repeated every fourth hour for several days. When purgatives are required, he gives rhubarb and calomel. As the cough subsides he diminishes the opiate, and substitutes gum myrrh in place of the ipecacuan wine. It is important to hold in mind that to patients labouring under hooping-cough, the great danger is from the complication with bronchitis; and in the treatment of the simple disease, our attention will be chiefly required to obviate this predisposition. The state of the lungs must be watched, and any approach to inflammatory symptoms met early by bleeding and purgatives, and (if the age of the child does not forbid) by tartar emetic. The latter medicine will also be found of use by facilitating the unloading of the stomach, which usually terminates a fit. Should the weather be cold, it will be well to have the child warmly clad, and to direct the use of flannel next the skin. When, under treatment of this kind, the disease gets through its course without any unpleasant events, and reaches the period of decline, we often find that although the patient be otherwise quite well, the cough will still continue. In such a case, when our interference appears to be necessary rather to break a habit than cure a disease, we shall often find change of air to be the very best remedy. [A change even from a better to a worse air, and even from one room of a house to another, is often serviceable. See AIR, CHANGE OF.] At this period, also, antispasmodics and sedatives may occasionally be employed with advantage. The oxide of zinc has been recommended by Guersent in doses of a grain every hour for a child of six months old; and in a case of the disease with some threatenings of convulsions, we on one occasion found benefit from musk. The latter medicine has also been highly recommended to us by a practitioner of considerable experience.

[Of late, iodide of silver has been advised in the dose of one-eigth to one one-fourth of a grain, three times a day. (Dr. C. Patterson, *Dublin Med. Press,* April 19, 1843, or Braithwaite's *Retrospect,* viii. 110, Lond. 1843.) It is said to have afforded decided relief.

Subcarbonate of iron has also been extolled by recent observers. Dr. Lombard (*La Lancette Française,* 9 Juin, 1838,) gave it in the quantity of 24 and even of 36 grains in the day to young children, either in water or syrup, or mixed with a cough mixture. It was found by Dr. Steymann to be especially advantageous after the first stage of the disease. (*Gazette Méd. de Paris,* Juin 20, 1838.)]

A cough mixture, containing a small quantity of tincture of opium or syrup of poppies, will sometimes be of use, as will also the laurel water, or, in adults, prussic acid itself, administered with due caution. In cases where considerable debility exists, or the disease, towards its close, becomes manifestly intermittent, the tonic plan may be required, and sulphate of quinine will be found to act most beneficially in conjunction with change of air and diet.

[Hydrocyanic acid, according to some, (Dr. A. T. Thomson, *Elements of Mat. Med. and Therap.* i. 435, Lond. 1832; and Dr. Roe, *A Treatise on the Nature and Treatment of Hooping-cough,* Lond. 1838,) is the sheet-anchor of the practitioner in simple hooping-cough. (*New Remedies,* 4th edit. p. 25, Philad. 1843.)]

Various external applications are popular in the treatment of hooping-cough, as the patent medicine called "*Roche's embrocation;*" and the "*pommade d'Autenrieth,*" composed of a part and a half of tartar emetic with eight parts of lard. [(W. Horn, *Encyclop. Wörterb. der Medicin. Wissenschaft.* xxvi. 606, Berlin, 1841; and Copland, *Dict. of Practical Medicine,* Pt. V. p. 250.)] These, however, are means very secondary indeed, in the treatment of any of the complications of the hooping-cough. In the simple disease embrocations which merely redden the surface can do no harm, and are sometimes useful, but applications containing tartar emetic or other violently stimulating substances, in addition to being unnecessary, very often produce pustules and ulcerations, which materially augment the sufferings of the patient.

Treatment of Complications.—The first complications of which we have spoken are inflammation of the bronchial mucous membrane, or of the substance of the lungs itself,—bronchitis and peripneumonia. And in truth it is to the guarding against these affections that much of our attention and remedial measures must be directed in the treatment of the simple disease. When from the occurrence of the symptoms mentioned above, we have reason to suppose the existence of one or both of these inflammations, we must at once take decided steps to cut short the disease, if possible; or should that not be practicable, to promote the speedy expectoration or absorption of the fluids effused into the bronchi and air-cells. The means of effecting the first of these indications are obviously those applicable to similar inflammations under ordinary circumstances, in which we do not propose at present to enter. A few peculiarities, however, are to be attended to in their use, to which we shall briefly advert. In the first place, we must observe that in bronchitis supervening upon hooping-cough, a more free use of the lancet is warranted and required than would be advisable in other cases, and for the reasons already mentioned that it is proved both by the symptoms and appearances after death, that the substance of the lung is almost always affected. With respect to the employment of purgatives, we would also remark, that although it is very necessary to attend to the state of the bowels, still continued purging will be found to produce a degree of flatulence, which by exerting pressure upon the diaphragm will considerably increase the dyspnœa, irritate the mucous membrane, and needlessly debilitate. We shall occasionally meet cases attended with so much irritability of the stomach and bowels as to prevent altogether the use of either ipecacuan or antimonial medicines. In these instances, of course, our reliance must be chiefly upon the lancet, aided by blistering, the warm bath, and small doses of nitre. In following up the second indication, after effusion into the bronchi and air-cells has taken place to any extent, we must be very cautious about the further abstraction of blood; this stage being attended with considerable debility, and our object being to prevent such exhaustion as would interfere with the process of expectoration. It is at this period we may expect most benefit from blistering, both by arresting inflammation and preventing further effusion.* To promote expectoration in older children, we may employ antimonials or a combination of calomel and ipecacuan in repeated doses. In very young infants, when the use of antimonials is not advisable, we may give an occasional emetic of ipecacuan wine and syrup of squills, and in place of calomel substitute hydrarg. cum cretâ in combination with pulv. ipecac.

We shall now turn our attention to the next train of morbid actions which we have mentioned as being occasionally attendant upon hooping-cough—a disordered state of the bowels and infantile remittent fever; and as these complications are rarely met with except in children, our observations principally apply to them. In speaking of the treatment of the simple form of hooping-cough, we alluded to the frequent occurrence of derangement of the bowels. This tendency exists in all acute diseases of children, and in practice it will be found that the most marked improvements in the symptoms of the original disease will attend the correction of the alvine discharges. It is important, therefore, to meet the symptoms indicating derangement of the bowels, by keeping up their regular action. If actual constipation exists, active purgatives will be required. Nothing is better for children than a combination of scammony, rhubarb, and calomel in divided doses, repeated until a full effect be produced. For patients more advanced, one or two grains of calomel, or three or four of blue pill, followed by any mild purgative mixture, may be administered. When the secretions are merely altered in quality without constipation, mild laxatives only will be required, as rhubarb and hydrarg. cum cretâ in the younger, and blue pill and rhubarb in older patients. The state of disease we are speaking of has been accurately described by Dr. Hamilton as the first stage of marasmus, and some very judicious observations are made by him upon its treatment. Unfortunately, however, the fatal facility of the purgative system has led to its adoption in this affection to an extent that has been very injurious, and was certainly never authorized by that able physician. Where the purging has been carried to excess, tenesmus, scanty mucous stools, tenderness of the belly, and a degree of tympanitic fulness succeed, which greatly aggravate the cough. Our object must then be to allay irritation by warm fomentation to the abdomen, soothing enemata, and sometimes, when the tenesmus is very distressing, by the employment of opiate glysters. When the bowels are so irritable as to be acted upon by the force of each cough with fetid depraved stools, a state which sometimes occurs in hooping-cough, small doses of hydrarg. cum cretâ and Dover's powder, followed by castor-oil, usually gives relief. When the symptoms become decidedly those of remittent fever, it is to them we must direct our treatment rather than to the original disease, as we shall always find the cough to become more distressing in a ratio with the increase of the fever, and on the other hand to be proportionately relieved by its decline. For the management of this form of fever we must refer to the article upon that subject. (See Fever, Infantile Remittent.) We may remark, however, that the observations offered above upon the administration of purgatives are even more particularly applicable here. A torpor of the intestines often exists to so remarkable a degree, as to render doses of purgative medicine quite inert that would at other times be amply sufficient. This we have been in the habit of accounting for by the congestion that exists in the head, and accordingly have found in practice that when strong purgatives have had no action by themselves, abundant effect was produced by a much milder one employed after a general bleeding, or, if the strength of the child did not permit this, after the application of leeches to the temples or epigastrium.

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* The practitioner must, of course, hold in mind the danger of incautiously applying blisters to children.

The last formidable complications of hooping-cough we have noticed are convulsions and hydrocephalus. When any of the symptoms already mentioned as premonitory of convulsions occur, our treatment must be guided by what we can learn of their causes and tendencies in each particular case. The convulsions of children, whether they are idiopathic or complicated with hooping-cough, generally depend upon the irritation of teething, irritation of the alimentary canal, or disease of the brain itself; and the tendency most to be dreaded is the hydrocephalic.

The indications, therefore, are to remove these irritations by attending to the state of the gums, by regulating the action of the bowels, and obviating local determinations, particularly to the head. When, in spite of our best directed efforts, convulsions, as will be frequently the case, do supervene, they must be treated according to the general principles laid down for their management under ordinary circumstances. When the attacks recur frequently and baffle the usual means of cure, there are two plans by which we shall often be able to prevent their return: one is, a total alteration of the child's diet, the other a complete change of air. When the child affected is at the breast, defectiveness of quantity or quality will usually be detected in the nurse's milk. Often it will be found that she has menstruated, or, as sometimes happens, that, without the discharge actually occurring, she has experienced sensations similar to those which attend the accession of the catamenia. In such cases the milk almost uniformly disagrees, and here it is a good rule, whenever the convulsive attacks withstand ordinary treatment, to inquire closely into the state of the nurse, and if there be any grounds for suspicion, to have a young and healthy one procured.—Change of air often in the most remarkable manner puts a stop to the recurrence of convulsions, and will be found particularly beneficial in those cases of spasm of the glottis to which we have already alluded.

Both these means will also act most usefully in protracted attacks of hooping-cough, even where there is no tendency to convulsions.

For the treatment of hydrocephalus, when it supervenes upon hooping-cough, we must refer to the article upon that disease. With respect to its prevention, the remarks made upon deranged bowels and convulsions are equally applicable as to those complications. One thing is to be remembered, that in conjunction with hooping-cough hydrocephalus is more than usually fatal, and requires our whole attention to its management.

Specific remedies.—An immense variety of these has been brought into notice, but if the views above offered be correct, their value will be less estimated. From what we have said of the simple disease, it will be seen that such medicines must be superfluous. Some of them from their violence are dangerous, and in the various complications it must be evident that no specifics are admissible. However, as some are strongly recommended, and may perhaps occasionally be of use in the decline of the disease, when the cough has become habitual, we shall give a list of the most remarkable, adding the names of those who brought them into notice.

Opium,	recommended by	Dr. Kirkland.
Cicuta,	......	Dr. Butter.
Belladonna,	......	Dr. Buckham.
Digitalis,	......	Various authors.
[Hydrocyanic acid,	....	Dr. A. T. Thomson and Dr. Roe.]
Bark,	......	Dr. Cullen.
Cup Moss,	......	Mr. Hayes.
Arsenical solution,	.....	Mr. Simmons.
Nitrate of silver,	......	Mr. Jones.
Assafœtida,	......	Dr. Millar.
Castor,	......	Dr. Morris.
Musk,	......	Mr. Hayes.
Artificial Musk,	......	Dr. Hufeland.
Camphor,	......	Popularly.
Oil of amber,	......	Dr. Underwood,
Meadow narcissus,	.....	Mr. Dufresnay.
Alkalies,	......	Dr. Stutz.
Antimonials,	......	Dr. Fothergill.
Cantharides,	......	Dr. Burton.
Acetate of lead,	......	Sauvages.
Cochineal,	......	Popularly.

C. Johnson.

[See Dr. Cowan's abstract of the remedies prescribed by different observers in hooping-cough, in *Provincial Med. Journ.*, May 13, 1843, and in Braithwaite's *Retrospect*, Pt. viii. Lond., 1844; also, Rilliet & Barthez, op. cit. ii. 234, and Condie, *Practical Treatise on the Diseases of Children*, p. 525, Philad. 1844.)]

HYDATIDS.—This word (derived from ὑδατὶς, *vesicula*, ὕδωρ, *aqua*,) has in descriptive pathology been indiscriminately applied to pellucid cysts, containing a transparent fluid, developed either in the cavities, or in various tissues of the human body, as well as in those of the inferior animals. These cysts, on minute examination, having been found to vary considerably in structure, and in some instances to possess the characteristics of animal life, an extended signification has been attached to the term, and it has been adopted as the name of an order of animals or animalcules, consisting of several genera and species.

It may be presumed that animal bodies have been subject to such vesicular formations from the earliest period, and the records of medicine abundantly testify that their occurrence has been com monly noticed from the time of Hippocrates to the present day, though, until a recent date, their real nature seems to have been little investigated. It must, however, be acknowledged that even up to the present time the term hydatid has a very indefinite meaning.

The general appearance of these bodies has probably had an influence in limiting the opinion entertained by medical men of their morbid effects to mechanical action, and experience has hitherto afforded no reason which invalidates it: it is to this cause probably that we must attribute the common notice of their occurrence by the early writers on medicine, without further description than that which the etymology of the word hydatid conveys; and as we find little in their observations which can serve to elucidate the subject, we shall endeavour to be very brief in showing how far they attracted their notice.

Hippocrates has adverted to them in his general application of the word growth, φῦμα, particularizing this kind by the nature of the contents; and he seems to have been well aware of their occurrence in some of the inferior animals as well as in man. It is remarkable, however, that he has only noticed their presence in the chest, a part of the body in which they are not most frequently observed, and where they are in general acknowledged to be only simple cysts.

Such were probably the nature of those to which he has alluded as the precursors of anasarca and hydrothorax, and as occurring frequently in the ox, the dog, and in swine, quadrupeds in which, he says, growths on the lung, containing water, were most frequently found, as dissection testified: "and such things (he adds) seem to be formed in man more than in cattle, inasmuch as our diet is more conducive to disease." (Περὶ τῶν ἐντὸς παθῶν, sect. v. p. 544.)

Aretæus alludes to a species of dropsy in the abdomen, *occasioned by several small bladders*, in proof of which he says, if the abdomen be pierced, a very small quantity of water escapes, these bladders including it; but their origin and nature he confesses were unknown to him, and adds that there were some who affirmed that bubbles of this kind passed through the intestines into the belly. (Lib. ii. cap. i. 51.) Celsus probably alludes to dropsy from the same cause in the observation, "modo corpus inæquale est tumoribus aliter aliterque per totum id orientibus;" but makes no direct mention of hydatids, or other reference to them. (Lib. iii. s. xxi.) Galen noticed the aptitude of the liver to generate them, and their frequent presence in this organ in animals killed without disease, (Comment in Aph. 55;) they are referred to also by Ætius, (Serm. x. cap. 20, p. 234;) and in the compilations of Bonetus, Morgagni, and Van Swieten, are introduced, from various sources, numerous observations on hydatids in man as well as in the inferior animals. The idea of the animalcular nature of hydatids, which appears to have first excited attention to the difference of bodies referred to under this name, was broached by Hartmann (Misc. Nat. cur. Dec. 2 A. 4to.) in the year 1685, and was the result of a more particular examination than had been before instituted on some taken from the inferior animals; it was particularly suggested by his witnessing their motions when immersed in warm water: his observations, however, seem to have been unknown to our countryman Dr. Tyson, when in the year 1691 he published in the Philosophical Transactions (No 193) a paper entitled "Lumbricus Hydropicus, or an essay to prove that hydatids often met with in morbid animal bodies are a species of worms or imperfect animals." It should be particularly borne in mind that Tyson's observations were made from hydatids found in the dissection of a gazella or antelope, and were consistent with a preconceived suspicion (by what circumstances suggested he does not inform us) that such hydatids were of the insect tribe, or at least their embryos or eggs. His reasons for this supposition, he states, were, first, that he observed them to be included in an outward membrane like a matrix, so loosely that, by opening it with his fingers or a knife, the inward bladder containing the lymph or serum seemed no where to have any connection or hold to it, but very readily dropped out, still perfectly retaining its contents:—secondly, from observing with the naked eye, that to the inward bladder there was attached a neck or white body more opaque than the rest of the bladder and protuberant from it, with an orifice observable at the extremity, which seemed to be occasioned by the retraction of some part of it inwards, serving, as he conjectured, the purpose of a mouth to suck the serum from the outward membrane, and so to supply its bladder or stomach, organs with which his imagination had also supplied it: thirdly, by finding with the testimony of another observer, that this neck, on being approached to the flame of a candle, did really move, at first protruding, and then retracting itself. On further examination, two small strings or pipes were observed proceeding from the neck, and floating in the liquor, the object of which Dr. Tyson conceived was to convey from the mouth the pabulum of the animal, derived by suction from the outer involving membrane. "Perhaps some," he adds, "may be more inclined to think that the whole is but an egg or embryo of another insect formation, and that this bladder is as it were the amnion, and the outer coat that includes it the chorion;" but having observed the same peculiarity of construction in every one of several hydatids taken from a rotten sheep, he considered such a supposition void of probability. The hydatids of the human body Tyson seems also to have minutely examined, and the circumstances in which he found them to differ he has noted in the record of a case so illustrative of the subject and fortunate in its termination, that we deem it well worth transcribing in this place:—"Thus in a patient still living, and enjoying her health better than all her lifetime before, about ten years of age, I caused her right side to be opened a little below her short ribs, whence issued out abundance of limpid water; but what was most surprising, together with it a great many hydatids, that first and last we guessed there might come out about five hundred of these bladders: most were entire and filled with limpid water, of others that were too large for the orifice the films were broken, but in none of them could I observe the neck, though I was inquisitive to find it, which makes me think them to be different from our present subject; as are also those I have frequently met with in the ovaria of women who have died hydropical, which I take to be only the eggs contained there, which by an extravagant flux of humours into them are often swelled to that prodigious size that I have taken several gallons of liquor out of them." Dr. Tyson further adverts to hydatids without necks, which he had found in the bladder of a human subject. "I shall only add," he says, "that the lumbrici hydropici I have always found hanging to the membraneous parts rather than included in the body of any of the viscera, as to the omentum peritoneum or the outward membranes that cover the stomach, liver, colon, or other intestines." Hydatids of this kind were afterwards examined by Pallas, (Miscel. Zool. Ed. Hagæ Comitum, 1766, p. 157,) and named by him tæniæ hydatigenæ, from the resemblance of their heads to those of the common worm of that genus. They have been further recognised as animalcules and adopted as such in the classifications of Linnæus, Fontana, Muller, Bloch, Werner, Cuvier, Lamarck, Zeder, Rudolphi, and Laennec. With regard to hydatids of the human body, Pallas has noted that those which came under his examination were void of neck and head, but that they evinced considerable contractility, as was exemplified by the retraction of their coats on division with a knife, "and with such force as to be turned almost inside outwards." The insect nature of the former having been acknowledged, the property just noticed was considered a title to the credit of distinct animalcular life in the latter, which had hitherto been regarded as morbid products endowed with the mere organic life of the parts with which they were found in contact. The new hypothesis seems to have been generally received with little further examination, and to have gained additional confirmation by the observations of Dr. John Hunter, published in the first volume of the Transactions of a Society for the Improvement of Medical and Chirurgical Knowledge for the year 1793. In this paper are detailed the case and dissection of a subject, with the result of an examination of some hydatids, taken from a collection found between the neck of the bladder and the rectum, compared with others which presented themselves in the abdomen of a rotten sheep. The just estimation of Dr. Hunter's evidence will induce us to draw largely on the information he has left on record; we cannot, however, but remark with regard to hydatids of the human body, that he has expressed himself in language presumptive of data acknowledged by him to rest only on probability, assuming the endowment of the highest functions demonstrative of animal life, for bodies in which the existence of the lowest order was a question yet undetermined. It is worthy of remark that the hydatids of the gazella, examined as we have already stated by Tyson, were found in a situation in that animal corresponding to that of the human subject from which Dr. Hunter's specimens were taken.

From the period at which animalcular life became a distinctive characteristic of certain hydatids in the inferior animals, and that this property, though on more slender evidence, was assigned to some others which were found in man, the prevailing inclination among medical writers and in oral communication has been to appropriate the term hydatid to those apparently so endowed; hence they have been denominated true hydatids; and to other pellucid cysts, formerly so considered, the epithet false has been applied in contradistinction.

From the preceding remarks it will be obvious that things most diversified in nature have been incongruously confounded under one name, and that to view them in their clear light as well as to see their pathological bearings with any profit or advantage, they must be severally considered with the definite signification proper to the classes in which nature presents them. These appear to us to be three in number, the *first* of which comprehends those hydatids which evince in their structure and properties the unquestionable endowment of distinct animalcular life. The *second* consists of such as have no evidence of animalcular life either in their construction or properties, but which has been assigned to them from certain phenomena, presently to be noticed, connected with their situation and growth. The *third* division embraces such as are universally admitted to have no place in the animal kingdom, but which may be regarded as excrescences or morbid formations, arising out of the natural tissues and organs of animal bodies.

The animalcular hydatids to which our first division refers have been observed to vary considerably in their structure, and have been ranged by naturalists in four distinct genera placed in the order *Vermes*, and thus designated, H. *cysticercus*, H. *polycephalus*, H. *ditrachyceros*, and H. *echinococcus*: to these a fifth genus has been added, constituted by the hydatids of our second division, the real nature of which, to say the least, is questionable, though they are commonly considered to belong to the insect tribe, and described as such under the name of H. *acephalocystis*.

The occurrence in the human body of the first four genera, and their specific consequences, have been little if at all investigated by the pathologists of our own country, and we find recorded by them only a single case in which any of them are particularly referred to. This case appears in the tenth volume of the London Medical Journal, but contains merely the statement that the patient had voided a number of tæniæ hydatigenæ, a name synonymous with the cysticercus of the above classification, and with the lumbricus hydropicus of Dr. Tyson, which, as we have already stated, was described by him and also by Dr. Hunter from specimens taken from the inferior animals. That their occurrence in the human body is not frequent, we infer from their having been rarely noticed by writers on pathology or medicine; but as minuteness of structure may have been more frequently overlooked than we have reason to suppose, and as they have been particularly adverted to on high authority, the following description, for which we are indebted to the labours of Cloquet, (Dict. des Sciences Méd. Art. *Hydatid.* Paris, 1818,) will, we conceive, be an acceptable guide for future comparison and inquiry.

Genus. 1. Hydatis cysticercus, *Rudolphi;* from *κυστις*, *vesica*, and *κερκος*, *cauda*. Body nearly cylindrical or slightly depressed, wrinkled, terminated by a caudal vesicle; head furnished at its base with four parts or suckers.

Sp. 1. Cysticercus, tenuicollis, *Rudolphi. Syn.* vermis vesicularis, *Hartmann;* hydra hydratula, *Linnæus;* tænia hydatigena, *Pallas;* vermis vesicularis eremita, *Bloch;* hydatigena orbicularis, *Goeze;* hydatigena globosa, *Batsch;* vesicaria orbicularis, *Schrank;* tænia globosa, *Gmelin;* hydatis globosa, *Lamarck, Bosc, Brugnières;* cysticercus lineatus, *Laennec;* cysticercus globosus, *Zeder.*

Character.—Head almost tetragonal, snout cylindrical, a little crooked, neck short, body small, caudal bladder nearly spherical. *Habitat.*—The peritoneum and plura of ruminating animals, and of swine, especially in sheep, oxen, and goats, in the stag, the roebuck, and gazella. A single instance is cited by Goeze of this species of hydatid having been found in the plexus choroides of an apoplectic human subject.

Sp. 2. Cysticercus cellulosus, *Rudolphi. Syn.* finna humana, *Werner;* tænia hydatigena ovilla, *Fischer;* tænia cellulosa v. finna, *Gmelin;* vesicaria hygroma v. finna, *Schrank;* hydatis finna, *Blumenbach;* vermis vesicularis, *Brera;* cysticercus finna, pyriformis, albo punctatus, *Zeder;* tænia hydatigena anomala, *Steinbach;* cysticercus finnus, *Laennec.*

Character.—Body conoid, from four to ten lines in length, caudal bladder ovoid, formed by a thin membrane, equal, transparent, without fibres; head tetragonal, furnished with four suckers, and thirty-two hooks divided into two rows. *Habitat.*—The hog, in which animal it causes the disease commonly known under the name of leprosy.

The word finna applied to this species of hydatid is of German extraction, from finnen, the name of this disgusting affection. Werner is reported to have found this species of hydatid in man.

Sp. 3.—Cysticercus fischerianus, *Laennec.* Body round, very slender, annulated; head larger than the neck, furnished with suckers and crooks; caudal bladder pyriform, three or four lines in length, united to the body by its large extremity, and terminating in a point which adheres to the viscus which this worm inhabits. No cyst. *Habitat.*—This hydatid has been found twice in the plexus choroides of the human subject, by M. Fischer of Leipsic. It is yet but little known.

Sp. 4.—Cysticercus dicystus. This worm has been observed but once, and then by Laennec; he met with it in the ventricles of the brain of a man who died of apoplexy. It presents two pretty large bladders; one of these is caudal, whilst the other encloses the body anteriorly. This, which consequently is only developed in a bag which forms part of the animal itself, is conical, annulated, composed of an outer membrane of a yellowish colour, rather transparent, and of an anterior substance, white and rather bluish, and almost opaque. It is crossed by a large canal, terminating in a cul-de-sac at the side of the head, but which at the other extremity communicates with the caudal bladder. The number of hooks of the head is undetermined. It has only four suckers.

Sp. 5—Cysticercus albo punctatus. M. Treutler is the only person up to the present time who has observed this hydatid; he found it in the plexus choroides of a woman who died at twenty-two years of age.

The body of this hydatid is three times longer than the caudal bladder. M. Treutler thought that he distinguished, with the aid of a magnifying-glass, one sucker and six hooks. The caudal bladder is spherical and sprinkled irregularly with small white points.

Genus 2.—H. polycephalus, *Reder;* cænurus, *Rudolphi*, from πόλυς, *multus*, and κεφαλὴ, *caput.* The derivation of the name of this genus explains its principal character. There are two species of it, viz. the P. cerebralis, and the P. *granulosus;* but as neither of them has been found in the human species, we shall pass on to

Genus 3.—H. ditrachyceros, from δὶς, *bis*, τραχὺς, *scaber*, and κέρας, *cornu.* Only one species of this vesicular worm has been noticed, viz. the D. *rudis.* The following is its character: Body oval, a line and a half long, flattened, terminated in a point posteriorly, enclosed in a membranous bladder, furnished anteriorly with a bifurcated horn, which appears rough to the naked eye, and, seen through a microscope, to be thick-set with straight and long scales. In which particular organ is the usual nidus of this hydatid is unknown. The specimens which Sultzer had an opportunity of observing had been expelled by stool from a young woman after having taken a purgative.

Genus 4.—H. *echinococcus*, from ἐχῖνος, *echinus*, and κόκκος, signifying a body of a round form with asperities, which characterise this genus.

Sp. 1.—E. *hominis.*—*Character.* Body pyriform, retracted towards the part where it adheres to the common bladder, one row of hooks on the head.

This species of hydatid was first found by M. Meckel, and afterwards by Zeder in the brain of a young woman. They were about twelve in number, and occupied the third and fourth ventricles.

Of the nature and effects of these hydatids in the human body little is yet known, their characteristic distinctions having been more an object of inquiry amongst naturalists than pathologists. Dr. Hunter has remarked, as Hartmann, Tyson, and Pallas had done before, that hydatids taken from a sheep (the cysticercus tenuicollis) even twelve and fourteen hours after the animal had been killed, moved briskly with a kind of peristaltic motion over the whole body, on immersion in hot water; and Sir Everard Home states that in a similar experiment made by himself, he witnessed a very evident contraction and relaxation of their bodies, with a brisk undulation of the circumambient fluid, which continued for half an hour, and exactly resembled the action of muscles in more perfect animals. (Croonian Lect. Lond. 1795.) The author last named submitted animalcules of the same kind to examinations with microscopical glasses of a high magnifying power, but was unable to detect any appearance of muscular structure: he remarked, however, that their coats resembled paper made upon a wire frame, and, as this structure does not belong to membranes in general, considered it to be the organization upon which their motions depend. (Ibid.)

Observations are wholly wanting as to the particular effects on the human body of those hydatids already described, and stated to have been occasionally found in it; but it is probable that their morbific agency must nearly correspond to that of any foreign body situated in the same cavity or structure. During life, unless when they are evacuated either naturally or artificially, there appear to be no means of ascertaining that their particular presence is the cause of constitutional disorder, even though, as when they occur within the cranium, it may be severe and irremediable. Under such circumstances therapeutic attention can be directed only on general principles to the relief of sympathetic disorder, and to the maintenance, as far as possible, of the due functions of the abdominal viscera.

Some of the inferior animals, particularly sheep, often become the subjects of disease in which the H. cysticerci are generated. A cachectic state of the body, followed by abdominal dropsy, commonly described under the vague and indefinite term *rot*, are the conditions with which their occurrence is most usually observed. Co-existent with them are frequently found pervading the liver and in its ducts great numbers of the flat vesicular worm named *fluke*, fasciola hepatica: the small intestines are at the same time blackish, and easily lacerable, and the glands of the mesentery enlarged and indurated; purulent tubercles and cysts containing transparent fluid are also observed to pervade the lungs. Hydatids of the same kind are apt also to be generated within the crania of these animals, giving rise to that singular affection commonly called gid or staggers, from the particular effect produced on their locomotive powers: their precise situation in this cavity has been frequently discovered by the effects produced on particular nerves and the action of those parts under their influence, indications which have sometimes led to their extraction, to the perfect relief of the suffering animals. Wet seasons, variable temperatures, and watery pasturage, are the causes to which the occurrence of rot in sheep, and consequently hydatids, are usually attributed; and Dr. Jenner has proved, by direct experiments made upon rabbits, that the same animalcules could be produced at will by feeding them solely on green succulent food. (See Inquiry into the Nature of tuberculated Accretions. By John Baron, M.D., 8vo. 1819, p. 96.) The production of hydatids in these instances is probably consequent to the general disease induced in the constitution, and its restoration to a healthy state in sheep is often successfully attempted by removing them to a dry and sheltered pasturage, with the exhibition at the same time of muriate of soda, considered the safest and most effectual of all the remedies of this distemper. To relieve the hydropic state of the body which accompanies it, diuretics are given, and it is from their diuretic action, we presume, that fox-glove and spirits of turpentine have been much extolled. Broom, heather, elecampane, and coltsfoot are also popular: and tonic medicines, such as the preparations of iron, have been highly recommended by those who have had the care of sheep thus diseased. How far medicines of the same kind may be useful in the human subject under circumstances apparently similar, we shall not pretend to determine; but direct experience having failed to supply the requisite information, some hints of practical advantage may be derived from analogy.

The second division of our subject refers to one distinct kind of hydatid which very commonly occurs in the human body, and is a simple bladder, more or less transparent, without any visible fibres or other traces in its organization of animalcular life. It has been considered, however, from some phenomena presently to be noticed, of the same nature as the hydatids already described, and has been classed with them under a name proposed by Laennec, viz. hydatis acephalocystis, derived from the Greek words *α, priv.* κεφαλὴ, *caput*, and κύστις, *vesica*.

The shape of the acephalocyst is uniformly round or oval, and in size they vary from the smallest perceptible through every gradation to that of several inches in circumference. Their coats are translucent and composed of a white semi-opaque pulpy matter, separable into two layers of variable thickness, in the same as well as in different specimens. The fluid they contain is clear and transparent like water, but occasionally of a yellowish or amber hue; but their most distinguishing characteristics are, that they are always found unattached to each other or to the cyst in which they are included, together with a fluid very variable in its nature, sometimes consisting of serum, at others of serum mixed with blood, or pus, or both; occasionally of pus only, and now and then of a fluid which has the appearance of dirty water with chalk diffused through it; and it is remarkable that, whatever it may be, it does not affect the contents of the acephalocysts, a fact which has been considered indicative of an assimilative function proper to their tunics, and hence to favour the hypothesis of their animalcular nature. The acephalocyst is sometimes solitary, but in most instances a great number of them are found in the same cyst or sac: the latter is usually of a firm texture, formed of condensed cellular membrane, and consisting of two laminæ, the outer of which is strongest and thickest; the inner tender, soft, and pulpy; but together they have a strong contractile power, and have been observed on incision forcibly to protrude their contents. These sacs are sometimes fibrous in their texture, fibro-cartilaginous, cartilaginous, and even occasionally osseous. When acephalocysts, immediately after removal from the body, have been partially divided with a knife, the cut edges have been observed to be immediately incurvated,—a circumstance which has been considered indicative of animal contractility. Adhering to the inner surface of a small proportion of them, several minute vesicles are to be seen, which have the appearance of so many pearls or studs; but examined with a microscope, they were noticed by Hunter to be merely sessile on the tunic, and to be covered by a thin transparent membrane, so as to be interposed as it were between the two. These he considered to be young hydatids, an opinion which Laennec amongst other pathologists also entertains; and that the numerous vesicles, observable with a microscope diffused throughout the fluid of acephalocysts, are of the same nature. They have been noticed in every variety of size, from the two-hundredth part of an inch in diameter to that of a red globule of blood, and even less: and the coats of the largest to be a little rough, with numerous filaments or villi, which, examined with a deeper magnifier, presented somewhat of a mulberry appearance. "It is not improbable," says Hunter, "that the small globules attach themselves by the villi to the side of the hydatid and to each other, and thereby give the appearance of being covered by a thin membrane. However that may be, the globules being found of various sizes floating in the liquor, seems to prove that they are originally formed there, and not in the coats of the hydatid upon which they are afterwards deposited."

To proceed with the graphic description of the same writer: "The hydatids in their growth and decay appear to pass through various stages; they are first found floating in the fluid that fills the hydatid, and afterwards attached to its coats. The hydatid thus pregnant with young, if the expression may be allowed, adheres to the neighbouring parts, increases in size, and becomes itself a sac, containing numerous small hydatids. These after a certain time decay, and the skins or empty bags are squeezed together into a substance like isinglass. It is probable they still undergo a further change; two small bodies of the size of a common bean, of a cheese-like consistence, and covered with a skin, were taken notice of adhering to the bladder near its neck," in a human subject, in whom the bodies now described were found between the rectum and the organ just mentioned. "It may be a question whether those were not the remains of hydatids; but that must be determined by future observations. It is to be observed that the young hydatids are found in two very different stages; in the one they are attached to the coats of an hydatid that floats loose in the parent bag or sac; in the other extremely small globules adhere slightly to the inner surface of a bag or sac, which is firmly attached to the neighbouring parts, and covered with a strong outer coat. It is obvious that the progress of growth is very unequal in these two, and, indeed, inverted; for in the first the young ones are as large as the heads of pins, while the parent bag is not larger than a walnut, and floats unattached; but, on the contrary, in the second there is a larger sac, with a strong outer coat, and a more tender inner one, adhering strongly to the surrounding parts, while the young ones that are very slightly attached to its sides are not of a larger diameter than a two hundredth part of an inch." Besides the small transparent vesicles already described, Laennec has remarked that on the exterior as well as interior surfaces of acephalocysts, some small prominences (*bourgeons*) of irregular form and variable size are presented to notice. These, we presume, correspond to the mulberry appearance adverted to by Hunter, and are considered by the former distinguished pathologist as nascent hydatids, which in a certain state of growth are detached, the interior increasing the number in the fluid of the acephalocyst, and those from the outside forming so many distinct and separate hydatids in the surrounding fluid. In some instances hydatids (probably of this kind) are stated to have been included in succession to the number of three or four, with the fluid proper to them interposed between the several layers, the last being distended in the usual manner of single hydatids. An illustrative specimen in a state of transformation, that appeared in the examination of a human body which came under his notice, has been described by Dr. Baron; at least such is our inference from the statement that its section exhibited a series of concentric laminæ, resembling very much the appearance of a urinary calculus. (See Dr. Baron's Inquiry, p. 95.) Another instance of the same kind is related by Sir Astley Cooper in his valuable work on Diseases of the Breast, page 41. Their appearance is thus described: when opened, they were found to be composed of numerous lamellæ, like the crystalline humour of the eye, or like the layers in the onion, which could be readily peeled from each other.

Acephalocysts have been found in almost every structure and cavity of the human body, but particularly in the liver, the uterus, the kidneys, and cellular tissue; they have been ejected in considerable numbers from the stomach by vomiting, and downwards from the intestines; brought up from the lungs by coughing, voided with the urine, and discharged from tumours in various parts of the body. Pallas seems to allude to their occurrence in the lungs and liver of the ox tribe and other ruminating animals, and Laennec has noticed their presence in sheep.

From the period of Tyson's publication already alluded to, it has been a question which refers particularly to the hydatids we are now considering, whether they are distinct members of the animal kingdom. We have cited pathologists of the highest repute who have supported this hypothesis, and it must be acknowledged that it has obtained an extensive credit; it behoves us, however, to examine the ground on which it is founded, believing, as we have reason to do, that the greatest misconception exists as to the nature of these bodies. Our knowledge of the structure of the acephalocyst has afforded no inference favourable to the conclusion, nor can we recognise any evidence of it in the retraction which is said to take place in its cut edges when divided, such being a phenomenon of mere organic life, and their incurvation an effect which would be mechanically caused in any spherical membranous bag distended with fluid under similar circumstances. Proof has been further sought, but found wanting, on the immersion of acephalocysts in hot water, no contraction having been evinced in obedience to this stimulus, which, as already stated, has occurred most obviously when the H. cysticerci have been the subjects of the same experiment. Baillie (Morbid Anat. vol. ii. p. 205) and Monro, (Morbid Anat. of the Gullet, p. 256,) as well as Huntur, (Medico-Chir. Trans. vol. i.,) contend that this failure in the anticipated result may depend on the hydatids (acephalocysts) having been allowed to remain a longer time in the dead body before examination, than would be compatible with their vitality, supposing them to be possessed of it. Dr. Monro has also stated that purulent matter proves fatal to hydatids, but if applied to acephalocysts, the assertion involves a petitio principii unsupported by facts. It must be admitted that there are phenomena in their economy difficult to be accounted for, from which arguments in favour of their animalcular nature have been advanced;

these we shall mention seriatim. 1. Their original production; 2. their growth and increase, without any vascular continuation with surrounding structures; 3. the unvarying identity of their fluid contents under the diversified media of that by which they are found surrounded; lastly, their inclusion, or, as it has been termed, the generation, of others often found in considerable numbers and different sizes within them.

The earliest hypothesis which appears to us to refer to the origin of the particular kind of hydatids now under discussion, ascribes their formation to an altered state of the lymphatics, suggested probably by a resemblance of the fluid proper to them to the usual contents of these bodies. It was supposed that on any accidental impediment to the transit of the lymph, the valvular structure of these vessels would prevent its reflux, and necessarily occasion a distension of its parietes between the obstructed portion and the valve immediately above it; and that, from their natural approximation to each other, a successive distension would ensue, giving rise to an adhesive apposition, or to a complete separation of them in the spherical form of the hydatids now called acephalocysts. This view of their formation seems to have originated with the celebrated anatomist Bartholine, afterwards to have been disseminated by Wharton and Nuck, and to have been generally adopted until their promotion, on the score of analogy, from the rank of inanimate to that of animated bodies.

If it be admitted that acephalocysts are animalcules, their origin must necessarily be involved in all the obscurity which envelopes the subject of generation in the lowest grade of insects, rendered still more incomprehensible by their natural localities in the bodies of men as well as of the inferior animals, unless, indeed, it be accounted for by the following general explanation, given us by Andral, which, to say the least, deserves considerate attention. "Besides the clot of extravasated blood which, by the experiments of Hunter and Home, has been proved susceptible of organization, it not unfrequently happens," says Andral, "that under the influence of causes more or less appreciable, the fibrine, either alone or accompanied with a considerable proportion of colouring matter, abandons the blood, and escaping from the vessels by some morbid process, finds its way into the adjacent tissues, as is proved to demonstration in the cavities lined by serous membranes. The fluid containing these is not unfrequently found to exhibit certain fibrinous concretions presenting evident marks of incipient organization; and of the same nature, though in a more advanced stage, may the transparent cysts now under discussion be considered, the formation taking place just in the same manner as the coagulum of fibrine, at first an amorphous mass, becomes vascular and organized." As successive links in the chain are placed "the cysticerci and other hydatids in their progressively complicated forms, and next to these the flattened worms, in which the characters of animal life, become much better marked, by the manifestation of unequivocal movements, and by the appearance of different organs as distinct and as well formed as those of the vertebrated animals. In this way we pass by regular and almost insensible gradations from the simple clot of fibrine deposited in the serous cavity, to the strongylus or the ascaris lumbricoides; just as during the formation of the embryo we observe it gradually advancing from the state in which it exists as a homogeneous mass, devoid of form or texture, until it acquires all the organs of a perfect animal; and as in the series of animated nature we can trace the development and progress of life and organization from the green matter of vegetables up to man. It appears to me perfectly futile to attempt fixing the point in this series of transformations where what is called animal life commences. If we give the name of animal to the cyst which floats loose in a serous cavity, and is moreover provided with vessels, and if we consent to admit the animal existence of this clot of fibrine, where are we to stop, or where draw the line of demarcation? If we admit to the rank of animal every aggegrate of matter which, being developed in the interior of a being endowed with life, is capable of supporting itself, and of increasing in size without having any connection with that being, the serous cysts already described must then be considered as animals, and accordingly they have been described as such by Laennec. But if we only recognise as animals those bodies which present some trace of sensibility or mobility, these cysts then forfeit all claims to that title; so that, in fact, this much agitated question turns out to be a mere dispute of words, which can never be finally adjusted until the contending parties shall agree in their definition of what it is which essentially constitutes an animal." (Vide Treatise on Pathol. Anat. Trans. vol. i. p. 477.)

The growth of the acephalocyst, it is evident, depends on some property inherent in its membranous portion, whereby it is fitted to appropriate to itself from the surrounding medium the particular fluid proper to it. The process appears to be analogous to that of secretion in serous membranes; but in the latter it must be remembered that red blood is the immediate pabulum of the secernents, whereas in the present instance it is a fluid which has already been eliminated from it; a circumstance certainly favourable to the hypothesis of the parasitic nature of acephalocysts, but which nevertheless may be referred to the mechanical process of imbibition, a property belonging, there can be little doubt, to the serous as well as other membranes of animal bodies.

The third division of our subject embraces the simple pellucid vesicles commonly called false hydatids, which are found either partially or wholly in contact with the adjacent tissues, and are supplied directly through them with the fluid by which they are sustained and their growths increased. As they have been usually adverted to in medical writings, they consist either of perfect bladders, capable of being detached without lesion of structure, or else are, as it were, diverticula from the subjacent membranous expansions, from which they could not be separated at their bases without laceration of a part essential to the integrity of one or the other. The manner in which the former are produced is a question yet undetermined, but the following explanation seems to us to be consistent with the knowledge we possess on the subject; that under particular condi tions of the system, either general or local, there takes place a deposition of serous fluid, which accumulates in proportion to the distensible nature of the part; but according as the latter is more resistant, an increase of pressure ensues, serving to condense the surrounding cellular membrane into a corresponding envelope, and thus to present an entire cyst. Bichat, however, contends that the formation of the cyst takes place prior to the deposit of the fluid, which, though scanty at first, increases with its growth, and that it is first developed in the filamentous tissue, according to laws analogous to those of the growth of parts in general, to be referred, in his view, to unknown aberrations or unnatural application of those laws. He argues thus against the explanation previously advanced: "1. That cysts are analogous in all respects to serous membranes, and should therefore have the same origin; 2. that the mechanical hypothesis of their origin, in which all the vessels ought to be obliterated, does not accord with the exhaling and absorbing function of cysts, nor with the mode of inflammation; 3. that if these sacs are formed by the mutual application and agglutination or adhesion of cells, (that is, of the filaments,) the contiguous tissue ought to be diminished, or to disappear when they are bulky, which is not observed to take place; 4. that if cysts are formed by condensation of the filamentous tissue, and if their fluid is effused by exhalation, this fluid ought to exist in the organ which separates them from the blood." (Elements of Pathol. Anat. by David Craigie, M.D., 8vo edit. p. 52.)

The second kind are produced by the distension of the interstices of the particular structures or of natural cavities with effused deposits of fluid, and vary, therefore, in nature, according to the texture of the parts in which they are situated, the quality of the fluid being determined anterior to its separation from its depositing vessels. It is, we presume to cysts of this kind, under the denomination of hydatids, that Boerhaave and Haller have ascribed an origin in the follicles of glandular structures; which Monro has treated of as an alteration of the cellular membrane; and in like manner Portal and Broussais as the result of a chronic inflammation of the capillaries which convey the blood deprived of its colouring matter to the cellular membrane interposed between the serous and other textures. Single cysts of this kind are sometimes met with, but frequently they grow in clusters, and resemble bunches of grapes; sometimes they are thickly set on a broad surface, and present a honey-comb appearance; occasionally they are found adhering to each other at their sides, and when crowded on the superficies of an organ having a cavity, or when produced in the same manner from the internal surface of another cyst, they occasionally lose their organic vitality in consequence of pressure at their pedunculated extremities. When single, they sometimes have broad bases, not unlike the vesications produced by a blister plaster, or boiling water, which might with as much reason be called hydatids as the cysts to which we now refer. The contents of these cysts as to quantity vary in every gradation from a single drop even to several pints of fluid, and are found also to differ in nature, being frequently clear, like water, often resembling serum mixed with blood, and occasionally purulent. To cysts of this kind recent pathologists have applied the term *hydroma.* Examples of it are often found in the female ovary, in which they vary much in size, and also in the colour and consistence of their contents from mere serum, with more or less of albumen, to reddish, bloody, or even tar-like fluid. Their appearance, it is probable, may depend on an altered condition of a particular part, as they have been frequently witnessed in bodies free from disease; but they are often the result of a hydropic state, which is general, when they appear to be produced under circumstances precisely corresponding to those of dropsy. Hence from an early period after the discovery of the lymphatics, their occurrence has been attributed to a morbid condition of this system of vessels; and though the links in the chain of their causes have never been distinctly traced, experience seems to prove that a cachectic state most commonly predisposes to their formation. Although frequently connected with disease which is irremediable, they are in themselves void of all malignant tendency; and their influential action on the organic function seems to be limited to the degree of pressure occasioned by their presence and the nature of the organ in which they are situated.

An hypothesis has been promulgated by Dr. Baron, that the hydatid or vesicular form is the primitive state of the tuberculous and other morbid formations, as the strumous, scirrhus, sarcomatous, steatomatous, and fungous. The period at which these transformations take place he states is very uncertain; that they may commence in a few days after the hydatid is brought into existence, or that they may not occur at all, the original structure continuing for many years. The occasional co-existence of hydatids with such morbid changes is consistent with general observation, and is confirmed by the undoubted testimony of several pathologists cited by Dr. Baron. Proof, however, is wanting that the one state is commonly consequent to the other; and supposing the elementary particles of such morbid growths to be deposited in a state of fluidity, we see no reason why they should be regarded as hydatids. On the same principles, we conceive, might every globule of blood or every collection of fluid be similarly classed, and thus the real nature of the product be lost sight of in the extension of a term already too vague and indefinite. Moreover it seems very improbable that morbid products arising under a diversity of constitutional circumstances, and manifested by appearances as well as producing effects as different, should at any intermediate stage evince a perfect identity of character.

To Dr. Baron's work, however, we refer for the full elucidation of his views, which could not be transferred to this place without obliging us unreasonably to exceed the necessary limits of this article; and we do so with the less reluctance, because, whatever may be the reader's conclusion, he cannot fail to benefit by the consideration of the facts and reasoning with which Dr. Baron has supported his positions.

It has been already stated that hydatids have been found in most of the structures of the human body :[*] we shall now proceed to the practical consideration of them according to their several localities.

Hydatids in the brain.—The presence of animalcular hydatids in the human brain has been rarely noticed, but the occurrence of cysts under this denomination has been very frequently referred to by medical writers. Their real nature it is impossible to determine during life, but their effects are found to be similar to those from any other foreign bodies in the same structures, passing on from those of nervous irritations to the partial impediment and abolition of the functions of the parts under their influence, and ultimately in most instances, it is to be feared, to death.

An instructive illustration has been given to us by Dr. Abercrombie, in the following case submitted to him by Mr. Headington :—A boy, aged eleven, was suddenly attacked with dimness of sight, amounting to blindness. It went off in a few minutes; but from that time his sight was gradually impaired, and after a year nearly lost. He then had an affection resembling chorea, and after a short time suffered an attack in which he lay speechless for three days. This was followed by hemiplegia of the right side. He complained much of his head, which appeared to his friends to enlarge, and he sometimes lost his speech for two or three days. His intellect was not affected, but at times extremely acute. He died, after coma of five weeks' continuance, about a year after the attack of hemiplegia, and two years from the commencement of the disease.

Dissection.—On the surface of the left hemisphere, the membranes adhered firmly to the surface of the brain for some extent on the middle lobe. On raising them at this place fluid escaped in great quantity, and on further examination it was found to have been discharged from the cyst of an immense *hydatid*, which was seated in the left lateral ventricle, and had gradually advanced to the circumference of the brain. It contained about sixteen ounces of limpid fluid, and besides these there were several ounces in the proper cavity of the ventricle. (Researches on the Pathology of the Brain, by John Abercrombie, M.D. Part iv. Case 29.)

In an examination of the brain of a man who died on the fifteenth day of synochus, we discovered not long since a pellucid cyst, full of transparent, yellowish, limpid fluid, lying close to the base of the brain at the side of the tuber annulare. Its size was that of a plover's egg, but during life there were no particular symptoms to indicate the presence of such a body. It would be to little purpose to go on enumerating similar instances of morbid formation. We refer, therefore, to the several works on general pathology, especially to those of Bonetus and Morgagni, and to the very valuable work entitled Elements of Pathology, recently published by Dr. Craigie, in which (page 477) references are given to several remarkable instances of similar encysted bodies found within the cavity of the cranium, and imbedded in the substance or cavities of the brain.

It is obvious that medical treatment under such circumstances must be limited to the relief of the organ oppressed, and to the suitable regulation of the functions of those which, primarily influenced by external agents, exert a corresponding action upon it. The means of effecting these objects could not be defined for general application, even if the cause of the existent disease were ascertained; but latent as it must be, alleviation of the consequent symptoms can be rationally attempted only by a reference to the general principles of therapeutics.

Hydatids in the thorax.—The lungs, though not often the nidus of hydatids, have occasionally been found to contain them; and instances are related of acephalocysts having been ejected from this organ by coughing. Their presence usually excites considerable irritation, and gives rise to cough, pain, dyspnœa, and quickness of pulse; but we are unacquainted with any particular symptoms by which their existence here could be positively ascertained. A case in which their expulsion from the lungs was followed by complete recovery has been recorded by Dr. Doubleday, in the fifth volume of the Medical Observations and Enquiries, by a Society of Physicians in London, 1779; and another by Dr. Monro, unattended with any pulmonary symptoms except that of pain on the right side of the chest behind the mamma, and which was not relieved by bleeding or the application of a blister. In this particular instance there was no sense of oppression nor difficulty of breathing, nor any alteration in the state of the pulse, and the patient could sleep on either side or on his back. By coughing he was relieved of portions of hydatids, and also of some entire, varying from the size of a hazel to that of a walnut, and in quantities amounting at times to as much as would fill a pint measure. The larger hydatids contained a fluid which was clear and viscid; in the smaller it was of a yellow hue and reported to have been bitter to the taste. A few days before their ejection the patient suffered very acute pain in the breast, which he compared to that of the penetration of a pointed instrument. The previous fits of coughing were violent and attended with paroxysms threatening suffocation which continued for two or three minutes. These effects were first manifested when the patient was fourteen years of age, and occurred at intervals for seventeen years, when at length he was attended by the present Dr. Monro and his father. Having been recommended to smoke tobacco and to inhale the fumes as deep as he could into the chest, the symptoms appeared to be arrested, and for the following eight years he was known to have remained free from any return of the disorder. (See Morbid Anatomy of the Human Gullet, by Alexander Monro, M.D. 8vo. edit. 1811, p. 279.)

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[*] Experiments on the nature of the fluid constituent of hydatids have not been sufficiently numerous and diversified to determine how far our knowledge of the subject may be advanced by the aid of chemistry. Dr. Marcet, in "an account of various dropsical fluids," (Med. Chir. Trans. vol. ii. p. 373.) has thus described his analysis. "A quantity of this fluid was procured from a hydatid attached to the kidney of a woman, whose body was opened by Mr. Cooper and myself at Guy's Hospital. It was clear and transparent, though of a yellowish colour. No coagulum or turbidness appeared on adding dilute sulphuric or muriatic acid, but concentrated muriatic acid produced a milkiness. Infusion of galls and oxymuriate of mercury occasioned precipitates. Heat did not produce any coagulation except after very considerable concentration. The specific gravity of this fluid was not ascertained, but a thousand grains of it being evaporated to dryness, at a temperature not exceeding 180°, the residue weighed thirty-six grains, and yielded by incineration a saline mass weighing 8.7 grains. This saline mass contained the usual ingredients; namely, muriate of soda crystallized chiefly in octohedrons, phosphate of iron and of lime, and a small portion of sulphuric acid. Upon the whole, this fluid, which was examined long since, and with much less minuteness than the other, appears to resemble much in its chemical composition that of hydrocephalus and spina bifida, only containing a larger proportion of animal matter, which appeared to be chiefly of the muco-extractive kind, since it did not coagulate by heat or gelatinize by cold or concentration."

Instances are on record of hydatids having occasionally passed through morbid perforations in the diaphragm into the thorax. In the first volume of the London Medical Communications, we read an account of a post-mortem examination in which "a common cyst found to contain a quantity of them, and attached to the liver, omentum, mesentery, and peritoneum, passed through a perforation in the diaphragm; from thence expanding again, it adhered to the plura and mediastinum, filled almost the whole of the left cavity of the thorax, and communicated in several places with the lungs, which were ulcerated. Had the patient lived long enough, it is possible that hydatids would have been coughed up, as one of the openings from the cyst into the lungs was large enough to admit a goose-quill." In the substance of the liver, which weighed sixteen pounds and a half, another large cyst was found. A similar case is related in the Edinburgh Medical and Surgical Journal, vol. ii. p. 170, in which, "an immense cyst occupying the whole cavity of the abdomen" was found after death connected to the mesentery. It was distended to the utmost, and contained thirty-five pints of hydatids, many of them exceeding the largest oranges in size. In both these cases the disease was supposed to be common ascites during life, and in both a fruitless attempt was made to draw off the fluid by tapping. An instance somewhat analogous has been recorded by Dr. Collet, (Transactions of the College of Physicians, Lond. vol. ii.,) in which hydatids originally lodged within the liver, were discharged by coughing: the patient, a female, aged thirty-seven, "first complained of lowness of spirits and of an oppression on her breath," followed by some œdema of the ancles, which, however, soon disappeared. A violent cough, attended with great dyspnœa, and the occasional expectoration of tough viscid phlegm, soon followed, and the subsequent ejection by coughing of hydatids at different periods in the course of six months, amounting to the number of one hundred and thirty-five: these varied from the size of a pea to that of a pullet's egg, and were in their ruptured state, no water either accompanying or following them: there had been a swelling at the umbilicus evidently containing fluid, and distension of the whole abdomen, which in parts communicated to the hand of the examiner the sensation of lumps; these, however, had disappeared, and the case promised a favourable issue. Another instance of the same kind is related in the London Medical Journal, vol. vi. p. 593, 1785. A lady, during an illness which continued more or less for three years, "coughed up several hundred of hydatids, most of which were burst, and of these many must have been as large as a pullet's egg: those which were not burst were only about the size of a nutmeg." This patient was considered dropsical, and to have disease of the liver; she, however, recovered her health.

It is probable that the bronchi are very rarely if ever the original seat of hydatids, but that they are passed into their ramifications from the parenchyma of the lungs and the pleura, or from other structures, as in the cases above related; but, under whatever circumstances, we may generally anticipate recovery if their expulsion through this channel has commenced, provided that other diseases be not co-existent, when of course the probabilities of the issue must depend on the nature and circumstances of the latter, and the remedial means be applied accordingly.

"Although," says Andral, "instances are not uncommon of animalculæ having been found in the vascular system of quadrupeds, I know only of a single occurrence of this nature in the human body." The subject was examined by himself at La Charité. "I found both lungs," he writes, "filled with hydatids, and thought that these *entozoaires* were lodged in the parenchyma of the lungs; but a more close examination disclosed the existence of hydatids in the pulmonary veins of both lungs. They had all the characters of acephalocysts. Around them the pulmonary tissue was in some cases sound and crepitating; in others obstructed and hepatized. An hydatiferous cyst, with cartilaginous parietes as large as an orange, existed in the middle of the liver, and contained from eight to ten hydatids. The individual who was the subject of this case was fifty-five years of age, for a year previously had been ill-fed, and often experienced considerable distress. The symptoms of an aneurism of the aorta under which he laboured were the object of therapeutic attention during life; and from the post-mortem examination, the latter appeared to be the effect of impeded circulation, consequent to the presence of hydatids in the pulmonary veins." (Andral's Pathol. Anat. Trans. vol. ii. p. 424; and Med. Repos. vol. xix. p. 347.)

Hydatids in the Abdomen. — Hydatids have been frequently found in the several viscera of the abdomen, occasionally attached to the peritoneum, and sometimes loose, either between it and the abdominal muscles, or amongst the viscera themselves.

Except the kidneys, the liver is more frequently affected with hydatids than any other organ, and in sheep as well as in some other quadrupeds, under the particular circumstances of wet seasons and marshy pasturage, this appearance of disease is apt to prevail very extensively. In the human species corresponding causes have not been observed to influence their formation, although there is reason to believe that a cachectic state of body has been conducive to it. Symptoms of a disordered liver to a greater or less extent are usually present; occasionally the same effect is produced as when a calculus is passing through the gall-ducts, viz. violent spasmodic pain at the epigastrium, frequent vomiting, with an unaccelerated pulse, and sometimes jaundice alternating with intervals of good health.

When hydatids are confined within the substance of the liver, there appear to be no means of ascertaining their existence; but when formed on its outer surface near its lower edge, it is probable that they may be detected by examination. When, however, the parietes of the abdomen are thick, and hydatids or their cysts not distinct, but lying in contact with each other and making an irregular tumour, it will hardly be possible to form an accurate opinion of their nature. If the tumour be gradually formed, and the general health little affected, it is probable that hydatids may be the cause. Close attention to the sensation which the tumour yields on pressure or on striking it gently with the hand, may also assist in enabling the examiner to form a probable idea as to its nature. If it should consist of hydatids, it will generally feel to a certain degree soft; and if the hydatids should be very large, there may be an obscure sense of fluctuation on striking the tumour with one hand while the other is applied to the opposite side of it. If, moreover, it should occupy a great part of the cavity of the abdomen, and can be clearly traced from the liver as the source of its growth, there can be little doubt of hydatids being the cause. (See Works of Matthew Baillie, M.D. vol. ii. p. 212.)

Some instances have already been referred to in which hydatids had passed through a perforation in the diaphragm from the abdomen, and were ejected by coughing from the lungs: they have occasionally also been evacuated from abscesses, and sometimes from the abdomen with the fluid discharged by tapping; in the former most frequently to the complete relief of the patient. The circumstances under which they thus occur being variable, preclude any specific character being given of them, and therefore must be illustrated by example. A female was treated with mercury under the supposition that hepatitis and consequent suppuration in the liver had taken place. In about ten days the mercury began to affect her mouth, and at the same time she voided an incredible quantity of the *tæniæ hydatigenæ*, or hydatids, by stool and vomiting, calculated by her attendants to amount to a thousand, varying in size from that of a small pea to an inch and a half in diameter. An hepatic abscess afterwards opened externally, a gall-stone was discharged from it, and she ultimately recovered. (Lond. Med. Journ. vol. x. p. 7. 1789.)

An instructive case of the same kind is related by Mr. Gaitskell, of Rotherhithe, in the fourth volume of the London Medical Repository. The patient, a married female, aged thirty-eight, had been under treatment for hepatic disorder with inflammatory symptoms, and, a short time after ptyalism was induced, began to void biliary calculi, which in three months amounted to forty-seven in number, and with them hydatids not less than a thousand, varying from the size of a grape to that of a peach. At the date of the report the patient was convalescent.

An example of fatality occasioned by a sac of hydatids situated in the porta or the liver, which by its pressure on the vessels produced complete obstruction and jaundice, is related by Dr. Duncan, Sen., in the Edinburgh Medical and Surgical Journal, vol. iv. p. 137.

Hydatids which are ejected from the stomach or discharged from the alvine canal, have in most instances been generated in the liver, but occasionally it is probable that they have passed from their common sac in consequence of its adhesions to, and resulting communication with, some part of this tube: they may be transferred in the same manner, we conceive, from the other abdominal viscera, but having found an exit through this channel, recovery so commonly ensues, that the opportunity of proving the truth of the remark by ocular inspection can rarely occur, nor can we adduce any such positive testimony in support of it.

From the co-existent disease, rather than from the presence of hydatids in the liver, the judgement of the practitioner must be formed as to the issue; and the requisite treatment of the patient must necessarily be influenced by the same circumstances. The hepatic disorder will generally be such as to render the exhibition of mercury necessary, and the stimulating effect of this remedy on the absorbent system renders its use, at all events externally, of considerable importance in the removal of hydatids, whether situated in the liver or in any other of the abdominal viscera.

The presence of hydatids in the spleen is an occurrence which has not often been noticed: during life the symptoms occasioned by them in this organ are too obscure to be recognised, and can never become the specific object of medical treatment. We shall subjoin a remarkable case of this kind in preference to any discussion which we cannot found on experience.

"A labourer, thirty years of age, of a phlegmatic habit, after lifting a heavy load, complained of pain in the chest, accompanied with cough and much debility. Two months afterwards his legs began to swell; he spat blood twice, a little at a time, which degenerated into a purulent expectoration of a bitter taste. He now applied for medical assistance, under the idea of his disorder being the first stage of pulmonary consumption. His pectoral sufferings abated, but the œdema increased, and the parts became erysipelatous, but soon changed their colour again on the application of dry aromatic fomentations; and the œdema subsiding on using twice anti-hydropic medicines, the patient thought himself cured. A short time after, however, when he had been at hard labour, the spitting of blood returned, and he complained of stitching pains in the chest; the scrotum was swelled, the pulse very slow, and digestion disturbed. These symptoms were also attended with headach. The pectoral sufferings were again soon removed, but the dropsical swelling remained, and a painful, hard, circumscribed tumour, beginning in the left hypochondrium, and extending upwards to the xiphoid cartilage, now made its appearance, which, with the obstinacy of the dropsical swelling, induced Dr. R. to make use of drastic medicines. An abscess now formed over the right knee, which effused a considerable deal of ichor; but the dropsy increased, and the patient at last died suddenly after a long ambiguous state of health.

"*Dissection.*—The greatest mark of disease was found in the spleen, which was unusually distended, and weighed about nine pounds; and a tendinous place was found in its centre, about the size of a hand, from which, on being cut open, a great quantity of water escaped, with a number of globular vesicles, varying in size from that of a millet-grain to that of a duck-egg, containing partly a clear liquid and partly a friable substance, which by the help of a magnifying-glass exhibited other small vesicles. Many of them were burst asunder and dried away. The bag containing these bladders divided the disorganized spleen into two halves, formed by an aponeuritic membrane, from half a line to two lines in thickness, interwoven with the substance of the viscus, and furnished with very swollen blood-vessels. It ran obliquely through the spleen, so that its larger half lay to the left and upwards, and the smaller to the right and downwards. All the other viscera were healthy, except that some water was contained in cavities caused by serous membranes." (Lond. Med. Repos, vol. vi. 1816, p. 332. Extracted from Horn's Journal, 1815.)

The pancreas is still more rarely the seat of hydatids than the spleen, and it is probable that their occurrence in this organ can only be ascertained by post-mortem examination.

Of the various organs of the body, the kidneys are more frequently than any other affected with hydatids: these for the most part are simple cysts produced in their peritoneal covering, and on inspection present an appearance resembling bunches of grapes: they may exist to a very considerable extent without manifesting any distinguishing characteristics of their presence during life, and without at all affecting the quantity or sensible qualities of the urine. Sometimes, however, though rarely, acephalocysts have been found to pervade these organs, but no particular symptoms have been evinced to render their presence recognisable during life. Pain is commonly felt in the loins during their formation; there has also been remarked symptomatic fever, nausea, and vomiting, but these are symptoms which belong also to other diseases: they have occasionally, however, been passed through the urethra, and in such instances have sometimes occasioned dysuria from interruption to the passage of the urine, either in the ureters, the neck of the bladder, or in some part of the urethra. (Works of Matthew Baillie, M.D. vol. ii. p. 257.)

One or more acephalocysts having been passed with the urine, a continuance or repetition of the precursory symptoms, or the subsequent occurrence of dysuria, will be almost certain indications that others are in their transit; and even if the same symptoms should have been caused by the passage of renal calculi in a subject prone to the latter formation, the treatment during the paroxysm consequent to the obstruction will alike be directed to the relief of an organic channel thrown into a state of spastic contraction in consequence of unnatural distention. The symptoms of acephalocysts in these as in other organs will be variously modified by other disease with which they are almost always connected, particularly, and most frequently perhaps, abscesses following blows or other injuries. On this account, therefore, it seems to us that examples are essential to an intelligible description of the morbid states in which their presence is evinced. We subjoin the following as particularly illustrative of renal acephalocysts.

"A gentleman, aged 32, was thrown from his horse in February 1780, by which he received an injury on the loins, and had considerable hematuria in consequence. After the first fortnight he experienced no further inconvenience until the June following, when he complained of cough attended with bloody expectoration, which he ascribed to the previous accident; but from a little attention he recovered, nor experienced any symptom of his late disorder until about three years afterwards. In December 1783, he was attacked with rigor, and felt a return of severe pain in the loins, extending to the region of the left kidney: in a few days he perceived an enlargement in the hypochondrium, which continued gradually increasing until the latter end of February 1784, a space of nine weeks: after the first month, the tumour was so little painful that the patient was enabled to travel to London, a distance of one hundred and thirty miles, to consult Dr. Lettsom, by whom the case is detailed. Upon examination the tumour, which was as large as an 'infant's head,' was found to contain fluid: it extended from the vertebræ of the back along the left *hypochondrium* to the umbilical region, and occupied the whole space from the ribs to the *os innominatum*. The pain increased with the swelling, and was aggravated by exercise or motion, but was relieved by an anodyne, "till at length some difficulty of making water came on, and for many hours a total obstruction: in this situation surgeons of the first eminence were consulted, to determine how far it would be advisable to make any incision in the side and perforate the cyst, in order to take off the pressure on the bladder, and obviate the fatal event which the retention of urine threatened: this was on the 20th of February; the result was, that, from the uncertainty of the situation of the tumour with respect to the intestines, which were suspected to take a curve over its anterior surface, as well as from the risk of exposing such parts to the external air, the operation was protracted, and the usual opiate of the patient was ordered to be increased in the evening, which was the chief remedy besides the use of cicuta and anodyne clysters. He passed a painful night, suffering frequent and violent rigors, but early in the morning experienced the most happy relief by a discharge of a large quantity of thick pus with the urine, which was followed the next day by that of pus and numerous hydatids.

"In a few days the tumour subsided, and the purulent discharge ceased; after this he continued recruiting in strength for nearly a fortnight, when his side enlarged again after exercise in a coach, probably by a large hydatid stopping up the ureter; rigors and strangury succeeded as before, and the tumour became as large as in the first instance, till the latter end of March, when he experienced a second discharge in every respect like the former, except that the hydatids were much larger. His health and strength again returned, until his side filled a third time after exercise on horseback, and continued swelling until the 25th of April, when he was again relieved by a third discharge of hydatids, and these were considerably larger than those of the preceding attack. The passages now became so open that he frequently discharged the hydatids, after walking or riding, without enlargement or pain of side; or, if he felt uneasy, or perceived a tendency to tumescence, by pressing his hand upon the side he could squeeze them into the bladder, where they would remain some time before they were discharged; but the hydatids became at length so considerable in size that it was with great difficulty they passed the urethra. The last that he voided was on the 12th day of July, which was so very large that it stopped up the urethra, and remained in it for a considerable time, until the weight of the accumulated urine forced its way. The earliest hydatids burst in their exit; they gradually increased in magnitude in every successive discharge, the first being not larger than a pea, and the last about the size of a pullet's egg. After the last mentioned discharge his health gradually recovered, and the patient enjoyed, without the least inconvenience, the chase and every other species of exercise as well as ever he did.

"During the whole progress and termination of the disease very little medicine was administered, except cicuta, gum arabic, clysters, and anodynes. He once took an emetic when the tumour became uneasy, previous to the second discharge, and which seemed to hasten the eruption of hydatids. Bark was tried, but with manifest inconvenience, between the eruptions, and was left off. After the last discharge it seemed beneficial, as well as asses' milk." (Memoirs of the Medical Society of London, vol. ii. p. 33. 1789.)

From the history of the disease there remains very little doubt but that it originated in the kidney, where the suppuration was extended to an amazing degree, till at length the pus, breaking through the cyst in which it was contained, passed into the ureter, and was thereby conveyed into the bladder.

A temperate man had been for some years subject to paroxysms of pain in the region of the right kidney, which appeared to descend in the course of the ureter of the same side, and ceased after discharging by the urethra some membranous bags (acephalocysts) of different sizes, some whole, but others broken and empty; there were considerable intervals between the paroxysms, during which the patient enjoyed perfect health; but the latter, from recurring every four or five months, had now increased in frequency, and the hydatids in size. The patient had suffered thus for ten years previous to the date of the above report, but at first their discharge was attended with a sense of weight or pressure rather than of pain, preceded sometimes with slight rigors. These discharges, together with purulent matter, at length recurred as often as five times within a twelvemonth, accompanied with increasing pain preceded by a sense of fulness in the region of the right kidney; for three years there was a cessation of the above symptoms, reasonably attributed to continued attention for four months to the following prescription of Dr. Lettsom:—

℞ Extr. cicutæ et pilulæ sapon. āā ʒi. fiant pil. xxiv. cap. ii. omni nocte.

℞ Elect. lenitiv. ℥i.
Æthiop. mineral. ℥ss.
Syrupi simpl. q. s. ut fiat elect. de quo cap. magn. nucis mosch. prout venter postulaverit.

℞ Uvæ ursi ʒiiss. coque ex aq. font. ℥ix ad ℥vi. sub finem coctionis addendo rad. glycyrrh. ℥ss. et cola.

℞ Liq. colati ℥iss.
Tinct. stomach. ʒi. fiat haustus bis per diem sumendus.

Three years having elapsed, the report states that after some considerable pain in the back, he voided again several more hydatids, of a longer size than formerly, to the basis of which, or that part which appeared to have been attached to the kidney, some sabulous matter adhered; he discharged several more at different periods, but had experienced such amendment from the use of the same prescription, the powder of uva ursi only having been substituted for the decoction, as to give a fair promise of perfect recovery. (Memoirs of the Medical Society of London, vol. ii. p. 43. 1789.)

For another instructive case of the same kind, related by Dr. Alexander Russel, the reader is referred to the third volume of the Medical Observer and Enquirer, published by a Society of Physicians in London, 1767. In this instance the patient retained his health, though at intervals he discharged hydatids with his urine occasionally mixed with purulent matter and streaked with blood; these at first are stated to have been round, "of the size of a common garden pea, *with a small stalk*." The patient about ten years before, when at school, had experienced "some violent complaints in the urinary passages, when he voided dark coffee-coloured urine with great pain." Dr. Baillie has given us an account of the dissection of a case in which the right kidney of the body of a man who had been a soldier was converted into a bag, capable of containing at least three pints of fluid, full of hydatids (acephalocysts) differing from a pin's head in size to that of an orange, and only a small part of the kidney retained its natural structure. (Morbid Anatomy.)

When hydatids have been passed into the bladder, irritation to a greater or less degree is excited to propel them with the urine, and it is probable that the exceedingly thickened state of the parietes of this organ in those in whom they have existed has been occasioned by increase of action, as was suggested by Dr. Baillie in the above-mentioned instance. In another related by Tyson the same effect was observed to have been produced: in the latter the cysts or sacs (acephalocysts) were twelve in number, varying from the size of a goose's to that of hen's eggs, and distended the bladder to the size of a child's head, though little or no urine was contained in it: the ureters are stated to have been impervious at their vesical extremities, but distended to the calibre of the intestines of a child, and at their renal extremities to the size of a hen's egg, the kidneys themselves being of their natural size and figure, but resembling rather large bags than fleshy substances: the cavity of the pelvis (whether of one or both kidneys is not stated) contained above three ounces of fluid. The liver, lungs, and heart of this individual were considerably diseased, and polypi were observed in the aorta and pulmonary vein. (Philosophical Transactions, No. 188, p. 332. 1687.)

Hydatids have occasionally been found between the bladder and the rectum, as in the case already referred to, which came under the observation of

Dr. Hunter,* and had occasioned only the particular symptoms of dysuria and distension of the abdomen: the patient, a man forty-six years of age, died suddenly, and on post-mortem examination the bladder was found to be enormously distended, reaching full eight inches above the pubis, its fundus having risen to within two inches of the arch of the colon; it contained between five and six pints of urine, and the hydatidous tumour was found between the neck of the bladder and rectum, completely filling the pelvis, and thrusting the former forwards and upwards. (Medical and Chirurgical Transactions, vol. i. p. 35. 1793.) It was remarked by Dr. Hunter that the prejudicial effects of the hydatids in this case were limited to those of mechanical pressure, and that of the numerous cases related by writers hardly any had proved fatal when an outlet for them was procured.

The peritoneum and its various duplicatures are occasionally the nidus of hydatids, i. e. of acephalocysts and those of the simple encysted kind, but rarely if ever without implication of disease of one or more of the subjacent viscera: it is probable that the development of the hydatids takes place under the different states of cachexy arising from a depressed condition of the vital powers, from the combined circumstances of constitutional diathesis and chronic disease, and not unfrequently are the consequence of inflammation of this membrane taking place under the same circumstances as ascites, with which they are commonly co-existent: the pathognomonic symptoms are thereby rendered extremely obscure, and there appear to be no other means of detecting this morbid process than by manual exploration of the abdomen, and thus only when there is an inequality in the surface, and a partial fluctuation can be perceived on altering the positions of the patient.

The constitutional symptoms complicated with those of the local disease are generally such as to betoken a fatal issue in the human subject, should the real nature of the distension of the abdomen from this cause be ascertained during life; but when the hydatiferous sac is situated between the peritoneum and muscular parietes, adhering to and distending the latter into a tumour, or, in fact, an abscess, as most frequently happens, an artificial opening will be the principal means of relieving the patient; and if this be the only disease, a favourable issue may almost always be anticipated. A sense of unequal fluctuation communicated to the hand of the examiner will be the only method of distinguishing the general nature of this from other tumours; and if the fluid of the common cyst is purulent, it will have the common characteristics of an abscess, the presence of hydatids being concealed until the latter be emptied of its contents, as will generally be the case also, whatever may be the particular nature of the contained fluid. The same observations will apply also to any part of the muscular structure with which formations of this kind may be connected.

Cysts commonly denominated hydatids sometimes constitute the bulk of tumefied ovaria, and are probably formed by the progressive enlargement of the small vesicles which belong to their natural structure; they often acquire an immense size in this organ as well as in the uterus, and vary frequently in their construction, some of the larger cysts enveloping smaller ones, and thus resembling acephalocysts, with which they have not unfrequently been confounded. The inner, however, will be found to be reflected from the outer cysts, like the serous membranes when they are reflected off from the internal parietes of cavities upon the organs contained in them, and to receive from them a continuation of vascular structure; in this respect differing essentially from the isolated state of acephalocysts, and always sufficiently distinctive of the latter kind of vesicular bodies. Though there appears to be no reason why acephalocysts should not constitute ovarian disease, we are not aware of any instances of the kind being on record; and as the preceding morbid condition more properly belongs to ovarian dropsy, and will be discussed under that head, it is not requisite to enlarge upon it here: we have to notice, however, that the suspicion of such an instance in a female forty years of age, who had the symptoms of ovarian dropsy, but attended with more pain than is common in that disease, has been recorded by the present Dr. Monro as occurring within the observation of his father: about a fortnight after the patient had been seen by him, the tumour subsided in the night, and the patient told him "that she had passed several watery stools with skins in them."†

Hydatids of the uterus constitute a morbid condition of this organ, very frequently referred to in medical writings, but it is probable that they are invariably attached cysts, and never acephalocysts. They are described by Baillie (Morbid Anat.) as vesicles of a round or oval shape, with a narrow stalk to each, by which they adhere on the outside to one another. A large one has generally a number of small hydatids adhering to it by narrow processes, and in the same manner to the uterus, by small filaments; and portions of a substance resembling blood and coagulating lymph are frequently mixed with them. A similar substance is attached to the internal part of the uterus, from which the footstalks of the hydatids grow. As these increase in number, they distend the uterus in proportion, and at length by their quantity stimulate it to contract upon them. "The cause of this complaint has not been ascertained; it sometimes appears as a morbid condition of the opaque membranes of the ovum; and in such cases, interfering with its functions, it destroys the vitality of that body, and thus produces abortion.

"It is probable that the existence of pregnancy is not necessary for the production of this disease; and perhaps a morbid condition of organized coagulating lymph may, under certain circumstances, have the power of originating it, but what these circumstances are is not known. It may admit of a doubt whether, in consequence of the morbid condition of the ovaria, some separation of the corpora Graffiani may not induce the complaint." Hydatids of the uterus, when arising from the destruction of an ovum, are preceded by the symptoms of pregnancy common to the period before this change takes place, and the time when it happens is marked by the breasts becoming flaccid, and the sickness and symptomatic effects of pregnancy going off; but of themselves they do not appear to produce any peculiar symptoms, with the exception of one to be mentioned hereafter. The greater number of inconveniences attending the disease arise out of the pressure made by the enlarged uterus upon the subjacent parts, such as retention of urine from compression of the urethra, constipation of the bowels from compression of the rectum, œdema, and cramp of the lower extremities. These symptoms, however, are not necessarily present, and instances have occurred in which they have been altogether wanting.—When the pelvis can no longer contain the enlarged uterus, that viscus will rise into the abdomen, and may be felt as a circumscribed tumour through the parietes.

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* Dr. Hunter has suggested that they may have escaped from a ruptured orifice of a sac originally formed in the spleen, and passed by simple gravitation into the pelvis.

† Morbid Anatomy of the Gullet, &c., by Alexander Monro, M.D., 8vo. Edin. 1811, p. 273.

The function of menstruation is usually interrupted as in pregnancy: on examination the body of the uterus will be found enlarged, and suddenly bulging out from the upper part of the cervix. All these symptoms, however, attend other enlarged states of this organ; but besides the absence of the movements of a fœtus, usually felt by a pregnant woman, the size of the belly and state of the womb rarely correspond with the supposed period of pregnancy, and from this condition as well as other diseases, it is especially characterized by the discharge of an almost colourless watery fluid. "This watery discharge is to be distinguished from that which attends the cauliflower excrescence, by the irregularity and suddenness of its appearance and cessation; being produced by a rupture of one or more of the coats of these hydatids, in consequence of the occasional contraction of the uterus upon them, or of any sudden violence, as in the act of coughing or sneezing; whereas the discharge from the cauliflower excrescence being a secretion from its surface, is constantly escaping. It may be distinguished also from those splashes of urine which sometimes come away from pregnant women, by being wholly inodorous."

When the uterus is excited to contraction upon hydatids, the process resembles that of incipient labour, for which it has unfortunately been mistaken even by experienced practitioners: "the os uteri is dilated; the hydatids are expelled by periodical pains; and then for the first time danger presents itself in the form of alarming hemorrhage. This hemorrhage is more frightful than that which follows the removal of the placenta from an uncontracted uterus; and the reason is obvious—the placenta covered only a limited space of the internal surface of the uterus, whereas the hydatids spring from every portion of the cavity. (Observations on Diseases of Females, by Charles Mansfield Clarke, part ii. p. 116.) In some cases milk is secreted after the hydatids are expelled, and occasionally pain in the hypogastrium with febrile symptoms follow.

The uterus is sometimes distended by a single hydatid or cyst to an enormous size, but this variety is very rare, for the very experienced author above cited, to whose invaluable work we are most largely indebted for our information on this part of the subject, has stated that such an instance has never come under his observation, and concludes, from the accounts given of it, that its effects are purely mechanical. From the equality and size of the enlargement "it would be difficult to determine whether it were produced by a single hydatid, or by a deposit of solid matter in the substance of the uterus. The fluidity of the contents of the tumour does not necessarily cause a sensible fluctuation of these contents. A full bladder felt above the pubis does not give to the hand the sensation of a fluid being contained within it. The discharge of a watery fluid in large quantities is in this variety of the disease the first announcement of its existence and the presage of its speedy removal.

"The water having escaped, the cyst is expelled, and the disease terminated without the occurrence of those distressing symptoms which threaten the patient's life in the disease first described.

"This last variety being very uncommon, the practitioner will hardly be prepared for its occurrence, and the patient expecting it to be of long continuance, will be agreeably surprised by an expeditious and favourable termination of her complaints.

"Examination by the finger will enable the practitioner readily to distinguish the single hydatid from the more formidable disease, fleshy tubercle; a discrimination of importance in forming the necessary prognosis, though symptoms arising from both forms of disease demand similar modes of relief."

It is probable that distention of this organ by hydatids is the particular condition to which some writers have referred under the term hydrops uteri; for it seems impossible from its natural position with respect to its aperture and fundus, that any large accumulation of fluid could take place, and continue for a length of time in it, unless enclosed in a cyst. Such is the expressed opinion of the writer above cited, and that neither he nor Dr. Denman should have witnessed such an instance appears to us evidence almost conclusive.

The presence of a tumour consisting, as suspected, of a bag of hydatids situated between the neck of the uterus and the rectum, has occasionally been found to interfere considerably with the process of parturition, but the nature of its contents it would appear impossible precisely to determine either before or after delivery, unless an opportunity were afforded by a post-mortem examination. A tumour of this kind would occasion little pain in its growth other than that arising from pressure on the surrounding parts, the nature of which would materially depend on its size; but the greatest inconvenience would consist during pregnancy, by its adding to the mechanical impediment to the passage of the urine.

As the occurrence of hydatids in the female breast, in the tunica vaginalis testis, the thyroid gland, and between the muscles and integuments, constitutes the morbid structure of local diseases especially belonging to surgery, their present discussion would be irrelevant to the particular objects of this work.

Having no reason to suppose that hydatids have any inherent malignancy, the variety of morbid actions resulting from their presence are to be ascribed to mechanical irritation and compression: these are seen to be modified by their size and number, their locality, and the predisposing circumstances of the constitution in which they may occur. As mechanical irritants, the effects they produce, whether inflammatory or spasmodic, must be treated entirely on general principles adapted to the age and habit of the patient, and other circumstances, either morbid or natural, under which their occurrence is observed. When a tendency has been evinced to their expulsion by natural processes, through either of the outlets of the alvine canal, art may take advantage of the suggestion thus afforded, and by an emetic or purgative, according to the operation already induced, expedite the accomplishment of the object to be effected. When they have had their seat in the chest, or have passed into this cavity from the abdomen, so as to be ejected through the lungs by coughing, nature may be allowed uninterruptedly to continue its purpose, but any morbid action that may result from the effort must be counteracted by the method of treatment its peculiarity may point out. When impacted in either of the biliary ducts, and giving rise to spasmodic pains and other symptoms resembling those which arise from biliary calculi similarly situated, an emetic, unless particular circumstances should contra-indicate its use, ought to be given, and if its action fail to procure the relief desired, the same kind of treatment will be required as for the analogous condition just referred to, viz. a full dose of the tincture or wine of opium, or Battley's sedative, or tincture of henbane with compound spirit of sulphuric ether in camphor mixture, to be repeated or not according to its effects: if the bowels should be in a constipated state, a combination of castor-oil and laudanum may be preferred, or if great irritability of stomach should prevail, opium combined with calomel, or with calomel and compound extract of colocynth, may be advantageously substituted: a hot bath, a blister to the epigastrium, and injections per anum of hot water with laudanum, or, if need be, purgative injections, are remedies one or all of which may be had recourse to as the necessities of the case may indicate.

When a cyst within the abdomen, containing acephalocysts, can be detected, and is adherent to its muscular parietes, distending them and producing great disorder of the system, an artificial aperture will be the readiest and perhaps the only method of cure. If contained within an abscess, the latter will be the prominent object of consideration, and the evacuation of its contents may prove a cure to the patient, and give the earliest manifestation of their presence. If not acephalocysts, however, but the attached hydatids which grow as it were from the organic structures or tissues, the disease with which they are complicated will form the more prominent object of consideration: it will be obvious that any distension of the abdomen from this cause cannot be relieved, as in ascites, from tapping, an operation to which, in the want of other means of relieving a patient, a practitioner may be urged: should the hydatids be numerous, little relief could follow, and even if the evacuation of a large hydatid were to promise greater advantage, the too common issue of such cases should warn him, except under particularly advantageous circumstances, against a step by which his reputation might suffer, and the expectation of the patient be disappointed.

When it has been ascertained that the liver is affected with hydatids, the removal of the hepatic disorder which must at the same time exist, should be the prescriber's aim; and the process will comprehend the only rational method of relieving the organ, and the rest of the system which sympathises with it. It has been suggested that mercury in its various forms may possess a specific quality adapted to the destruction of the vitality of animalcular hydatids, particularly acephalocysts; and on this principle has its use as well as that of some other medicines been resorted to when their presence has been recognised or suspected. How far the idea may be founded on fact, time and particular attention to the subject must determine, but experience has sufficiently shown that its influence in such cases of disease has been most salutary, and is indispensable to restoring the natural secretion of the liver, and thereby communicating to the whole of the assimilative organs that degree of vigour which is the main defence of the system against noxious influences from without and morbid depositions within the body, and still further to the removal of various products of disease which a contrary state has engendered. The specific stimulus also of mercury to the absorbents is an additional reason for its prescription when the more direct removal of hydatids cannot be effected, whether situated in the liver, spleen, pancreas, kidneys, peritoneum, or other structures.

When productive of great inconvenience from their situation between the rectum and bladder, or, as in pregnancies, between the vagina and the rectum, and the nature of the resulting tumour can fortunately be determined, an incision into its most prominent part it is probable will speedily and effectually relieve the patient. The circumstance, however, being rare, and the records of medicine affording no general guide for practice on this point, the writer feels it incumbent upon him to state that the above recommendation has been suggested by the perusal of a valuable paper on tumours within the pelvis occasioning difficult parturition, by Mr. Park of Liverpool, inserted in the second volume of the Medico-Chirurgical Transactions, p. 296, and particularly by a successful example of the practice therein recorded, and of another in which the tumour disappeared in consequence of the pressure occasioned by the act of parturition. If hydatids have been voided with the urine, and symptoms should arise indicative of the passage of more of these bodies from the kidneys to the bladder, relief should be sought by the immersion of the patient in a hot bath, and by the administration of antispasmodics, as advised for the corresponding effects produced by their impaction in the biliary ducts. If checked in their passage through the urethra, the impediment we conceive might easily be overcome by rupturing the enveloping bag with the point of a bougie. When the uterus has been the seat of hydatids, we are told by the highest authority that "all attempts to cure the disease artificially, and to arrest its progress otherwise than through the natural efforts of the organ, have been of no avail. The patient is to be informed of its nature, and the result is to be patiently waited for. As symptoms arise they are to be treated accordingly, and the practitioner will best perform his duty by watching over the complaint, and by doing no more than is absolutely required. But when the period arrives at which the uterus is excited by distension to unload itself of its contents, then all his skill and energy will be wanting, and all his efforts will be called forth to control the hemorrhage and to sustain the powers of the constitution." "Two or three fingers or the whole hand should be covered with pomatum, and carefully introduced into the uterus, and carried up between its sides and the hydatids, which are to be detached from the part to which they adhere by the most gentle efforts. The mass being now included in the hand of the operator is to be brought out of the uterus, it being remembered, in the performance of this operation, that the degree to which the os uteri is dilatable without laceration is in proportion to the size of the whole uterus both in pregnancy as well as in this disease. So that, supposing it to be enlarged by hydatids to the size of the viscus in the sixth or seventh month of pregnancy, the whole hand may be, if necessary, introduced through the cervix; whereas, in smaller dimensions of the uterus, if any attempt is made to introduce it through the cervix, however carefully it may be attempted, a laceration of it may ensue, and thus the patient be involved in a new danger. The contents of the uterus having been naturally expelled or artificially removed, and the hemorrhage restrained, the strength is to be restored by allowing the patient a nutritive diet, and by the exhibition of such medicines as tend to increase the tone of the system, amongst which the mineral acids and preparations of cinchona may be accounted the most serviceable: these or other medicines, possessing similar properties, should be from time to time exhibited until the vigour of the system shall have been entirely restored.

"The usual cautions given to women after delivery should be here impressed upon the patient, such as confinement to the horizontal posture until the parts shall have acquired their usual size and tone." (See Observations on Diseases of Females, by [Sir] C. M. Clarke, M. R. C. S. &c. part ii. p. 120. Lond. 1821.)

"The acknowledged efficacy of the ergot of rye in stimulating the pregnant uterus to contraction, suggests the idea that it may in the same manner be administered with advantage as soon as it is known that the distention of the uterus is occasioned by hydatids: the writer, however, is not aware that it has ever been used under such circumstances, but as there is some reason to believe that it possesses to a considerable extent the additional property of restraining the hemorrhagic tendency of bleeding vessels, it appears probable that it may prove an eligible medicine for the purpose above specified."[*]

The single hydatid of the uterus by its growth effects its own cure, and thus affords a hint which may, under other circumstances of the disease, be usefully applied; when arrived at a considerable size, a rupture of it suddenly takes place, its fluid escapes, and the cyst is expelled; the patient being in a moment relieved of her sufferings and the cause of her fears, in most instances requiring nothing more than a bandage round the abdomen to give support to the organ which has so long been distended and consequently relaxed.

In all cases of hydatids the condition of the body and the specific nature of the co-existent disease, be it either predisponent or consequent, must be special objects of remedial attention; hence the treatment connected with these morbid formations involves also that of cachexia, of the various disorders of the digestive organs, of dropsy, &c., each of which having a proper place in this work, it is necessary only to refer to them here; and it would be further a waste of time to dwell on means to be adopted for the removal of a morbid deposit under circumstances in which its presence could only be discovered by post-mortem examination.

Abstractedly considered, the removal of hydatids may be contemplated by three different methods: first, by their direct expulsion from the body, either naturally or artificially, as already explained; secondly, when their expulsion cannot reasonably be anticipated, by re-invigorating the relaxed habit of the body, and thus communicating to the absorbent system its lost power, an indication which will also be required to be attended to for the prevention of their recurrence when already got rid of; thirdly, by exciting the absorbents to extraordinary action, when the exercise of their natural function is inadequate to the end in view.

To reinvigorate the relaxed habit of body it will be necessary to avoid the influence of the external causes by which it has been reduced to this state; to select a dry and healthy residence; to use a nutritious diet adapted to the powers of the organs of digestion, improving the condition of the latter by promoting, in the first place, the due secretion of the liver, by the exhibition of such of the preparations of mercury and to such an extent as the occasion may demand. The irritative fever induced by such disorder having been allayed, the tone of the stomach must be invigorated by corresponding medicines, as, for instance, by some of the preparations of cinchona, especially the sulphate of quinine, or by quassia, rhubarb, gentian, or cascarilla, combined either with the alkalies or sulphuric acid, according to the condition of the stomach and alimentary canal: the preparations of iron and sulphate of zinc are also medicines which will generally be adapted to constitutions thus affected.

When these or similar means are found unavailing, and the inconvenience resulting from the presence of hydatids is so considerable as to render it expedient to attempt their removal by exciting the absorbents to extraordinary exertion, a process which requires more discrimination and care perhaps than any other in medicine, it will be necessary either to have recourse to the free use of mercury in one or other of its forms, or by persevering in the use of evacuants of the alvine canal or kidneys, or by maintaining a continued state of nausea with repeated doses of tartrate of antimony to effect the same end; but of all the excitants of the absorbent system none appear to have so direct and powerful an influence upon it as iodine: we have, however, no experience of its use in disease resulting from hydatids, and rest our anticipations of its efficacy in such cases on the great advantage stated to have been derived from it in scrofula as well as from the particular actions observed to have been produced by it in the treatment of this disease. (Lugol on Iodine, by Dr. O'Shaughnessy. 1832.)

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[*] "In the fourth number of the Glasgow Medical Journal, Dr. Macfarlane, in his observations on *polypus* of the uterus, gives a case where the ergot appeared to act by promoting the expulsion of the polypus. One drachm was infused in four ounces of water, and one ounce given every two hours. The whole was given before the effect was produced. In the course of a few hours the tumour was discovered to be in the vagina. Four days after the exhibition of the ergot the polypus fell off."—From Dr. Young's Observations on the use of Secale Cornutum, in the Transactions of the Medico-Chirurgical Society of Edinburgh, vol. iii. p. 578.

In the article Bronchocele will be found an excellent account of the medicine in question, which renders it unnecessary for us to enter into any further discussion upon it here; we shall, therefore, merely state, as the result of our own experience of iodine and the hydriodate of potash, that the evidence of their effects on the system in medicinal doses becomes very gradually perceptible, but that these remain so long after their use has been discontinued, as to be prejudiced by their excess, and, as far as we know, the means have not been discovered for regulating them when the necessity has been indicated.

[From a brief article in the *Medico-Chirurgical Review* for April 1844, p. 473, it appears that Professor Klencke, of Brunswick, has instituted some researches on the transmission of hydatids by contagion. The writer has not seen the original paper, but the following are stated in the Review to be Professor Klencke's general conclusions. *First.* That in all species of hydatidic animals, the mode of generation is twofold—fissiparous and oviparous. *Secondly.* That there are false or spurious hydatids, which are propagated by *blastidia.* *Thirdly.* That all the different sorts of hydatids are communicable from one organism to another; and as they are found to exist in fluid food and in the flesh of different animals, they may be readily transmitted by infection. *Fourthly.* That the acephalocysts are not distinct from the echinococci; the former are only the ova of the latter, with or without the parent envelope. *Fifthly.* That the current of the circulation serves to diffuse the hydatidic animalcules, whatever be the mode in which they have been introduced into the system. *Sixthly.* That there exist agents in the living organism, as well as numerous substances in the Materia Medica, which are capable of acting as poisons to these parasitic productions.]

William Kerr.

HYDROCEPHALUS, from ὕδωρ, water, and κεφαλὴ, the head. Under this term was formerly comprehended every preternatural effusion of serous fluid in the region of the head, whether external to the cranium or contained within it. In process of time, however, it became limited to effusion occurring within the cavity of the skull. Systematic writers have laid it down that such effusion may take place either between the cranium and dura mater, into the great cavity of the arachnoid, in the subarachnoid cellular membrane, or finally into the cavity of the ventricles. But hydrocephalus, in the more limited sense in which it is usually understood in this country, means a serous effusion taking place into the ventricles, or (which is a much rarer occurrence) into the sac of the arachnoid.

The disease is divisible into acute and chronic. Hufeland, Coindet, and many other late writers, have restricted the use of the name hydrocephalus to the chronic effusion, and have employed the term hydrencephalus to designate the acute variety; a species of nomenclature which is objectionable, as it proceeds on the erroneous assumption that the water in the latter case, and in it only, is always confined within the cavities of the brain.

1. Acute Hydrocephalus.—This species has been defined by Cullen—a disease which affects chiefly infants and young persons under the age of puberty, arising gradually, and manifesting itself at first by lassitude, feverishness, and pain in the head, and subsequently by slowness of the pulse, dilatation of the pupil, and somnolence. In addition to several of the above symptoms, Hufeland (*Conspectus Morborum—Hydrencephalon*) has noticed in his definition the tendency to convulsions and paralysis, vomiting and constipation.

Though the chronic species is plainly alluded to by several of the older writers, it has usually been supposed that the symptoms of the acute had, till the beginning of the last century, when it was imperfectly described by Petit, escaped the observation of practitioners. This, however, is a mistake, as Hippocrates was certainly acquainted with it, as appears from a passage in the treatise *De Morbis*, (lib. ii. cap. 6,) where he distinctly notices this species of water in the brain, and says that it gives rise to acute headach, pain in the eyes, double vision, blindness, vomiting, and fever;—thus clearly enumerating some of the most characteristic features of the disease, whilst at the same time he recommends purgatives, emetics, and errhines, as the means best suited for its removal.

The first accurate account of acute hydrocephalus which appeared, was that by Dr. Whytt, in a posthumous work published in 1768, entitled *Observations on the Dropsy of the Brain.* His history of the symptoms and progress of the affection is so full and accurate, that a late French writer asserts that little of any importance has been since added to it. So much cannot, however, be said for his hypothesis as to the nature of the disease. He considered it a kind of passive dropsy, and all its symptoms merely the effect of the pressure made on the brain by the effused fluid. The disposition to vomit is attributed to the sympathy of the stomach with the brain; the slow, irregular pulse of the second stage, to the cardiac nerves receiving an imperfect supply of nervous energy; the quick pulse of the third stage, to the injury now done to the cerebral fibres, and the irritation thence arising in the whole system; and, finally, the dilatation of the pupil and stertorous breathing, to the compression of the brain. But neither his theory of this affection, nor his despondence as to the possibility of its ever being cured, have been justified by later and more extensive observation. Dr Fothergill's remarks on the hydrocephalus internus, and Dr.

Watson's observations on the same subject, appeared soon after, and the latter contained one of the first instances on record where the disease terminated in recovery. A valuable addition to the usual mode of treatment was made known in 1775 by Dr. Dobson, who, with a view to increasing the activity of the absorbents in the brain, was led to the employment of mercury, and had the satisfaction to find it successful. The first approach to a correct theory of the disease was contained in the thesis of Dr. Quin, of Dublin, published in 1799, in which he pointed out its affinity to the inflammatory diseases, and supported his views by a reference to the appearances which are found on dissection in those who have fallen victims to it. This manner of considering the disorder necessarily led to a great improvement in the mode of treating it. A similar view of hydrocephalus was taken about the same time by Dr. Rush of Philadelphia, who believed it to be closely allied to phrenitis, and pushed the antiphlogistic method of treating it still further than Quin had done. Dr. Withering held a similar opinion as to its inflammatory nature, and, like Quin and Rush, considered the effluvia here, as in many other instances, a mere result of inflammation, and not as constituting the essence of the disease. His introduction of digitalis into its treatment likewise entitles him to a place in the literary history of this affection. Dr. Percival of Manchester strongly advocated the use of calomel and opium in hydrocephalus, and strove to give precision to the mode of employing the various remedies previously in use. Amongst the writers who have most contributed to throw light on the nature and treatment of hydrocephalus, we may place, in addition to those already mentioned, the names of Cheyne and Abercrombie in this country; Odier and Coindet in Geneva; Guersent and Lallemand in France; Formey, Portenschlag, and above all Gölis, in Germany. Besides these, we shall have occasion to allude, in the course of this article, to several others who have made important additions to our knowledge of the disease.

Precursory Symptoms.—In a great majority of cases premonitory symptoms may be detected; and of these the greater number and the most striking are connected with derangement of the digestive organs. The appetite is either capricious or defective; the tongue slightly furred, and the breath heavy; the epigastrium and hypochondria are occasionally tumid and tender on pressure; the biliary secretion is deficient or vitiated, as is evident from the torpor and irregularity of the bowels, and the unnatural appearance of the stools; the urine is high-coloured and diminished in quantity; the cutaneous circulation loses much of its vigour, as is evident from the faded and unhealthy complexion and harshness of the skin. To the attentive observer slight indications of the derangement of the cerebral functions may even at this early period be discovered, in the languid manner and frequent drowsiness; the disturbed and restless sleep, from which the child awakens unrefreshed; in the occasional complaints of giddiness or confusion, of noise or slight pain in the head, or of pains like those of rheumatism in various parts of the body and limbs. The pulse as yet deviates little from its natural condition, but on attentive examination some of its beats are found weaker than others, and an occasional intermission may sometimes be detected. The child becomes silent and irritable, indifferent to such persons and things as it formerly took an interest in, frequently assumes a grave and thoughtful appearance, or falls into a reverie, from which it awakens with a sigh. Notwithstanding all this evidence of deranged function, the patient often makes little complaint, even when closely questioned. When the disease is about to manifest itself in a more unquestionable shape, flushings and chills frequently alternate; the gait becomes laborious and unsteady. "In stepping forward," says Gölis, "they raise the foot as if they were stepping over a threshold—they totter and stagger as if drunk."

Dr. Yeats, who has made the earlier stages of the disease his peculiar study, places amongst the premonitory symptoms occasionally present, tenderness in the scalp, stiffness of the neck, increased sensibility of the eyes to light, and in some rare cases severe ear-ach. He also draws attention to the remarkable change from the healthy appearance which the countenance undergoes, the transient paleness and occasional collapse of the features, the dulness and loss of expression in the eyes, and the dark line under them. A teasing cough is sometimes present; there is an unusual tendency to constipation. If aperient medicines be given, the consequent evacuations are both harder and less abundant than they were wont to be from a similar dose; in colour they are sometimes lighter than natural, and at others tinged of a dark greenish hue, and accompanied with slimy matter.

It must be confessed that there is nothing essentially characteristic in the above symptoms, and that even when all are taken together, they rather indicate a derangement in the functions generally, than point in an unequivocal manner to incipient disease of the brain. Still they are sufficient to justify much watchfulness on the part of the friends and of the medical attendant, and particularly so when the child discovers an unusual precocity of intellect, or is one of a family which has already suffered from hydrocephalus, or from scrofula in any of its forms. The mere occasional exhibition of a purgative will in such cases, as Dr. Yeats very truly observes, usually prove quite inadequate to the removal of the symptoms; nothing less than the systematic employment of a combination of alteratives and aperients, continued for some time, being capable of producing this effect.

Dr. Cheyne has the merit of having been one of the first writers who strongly directed the attention of the profession to the derangement in the functions of the liver and of the alimentary canal, which so often precedes, and not unfrequently seems to excite, this affection of the brain. The proportion of cases in which the diseased action commences in the abdominal viscera is, he thinks, very considerable. He was led to this belief partly by having observed how usually derangement of the above-named organs precedes hydrocephalus, and partly from the remarkable benefit which, in the early stages of the affection, so often ensues upon the use of active purgatives, and finally, from the frequency with which unequivocal marks of disease are discovered in the liver or intestines on dissection. In the incipient stage, or while the disease of the brain is as yet only forming, the colour of the stools indicates an inactive state of the liver, whilst at a subsequent period, when hydrocephalus has become fully established, the bile seems to be both vitiated and in excess. The intimate sympathy which exists between the brain and the liver is well known to surgeons, and that between the brain and the stomach and intestines is familiar to every one.

There is, we think, a general aversion amongst French pathologists to admit the sympathetic or secondary origin of diseases, and accordingly most of them, in treating of hydrocephalus, have looked upon the morbid appearances found in the abdomen as a mere casual complication, and by no means the cause of the cerebral affection. M. Brachet of Lyons has, however, departed from the general rule, and admitted a gastric variety of hydrocephalus, (hydrocephalite gastrique,) in which the disorder of the digestive organs evidently precedes that of the brain, and in which subsequently, during the progress of the cerebral affection, the violence of the gastric symptoms seems clearly to indicate that the irritability of the stomach is not the mere effect of sympathy, but the result of inflammation in the mucous membrane itself.

Less importance has been attributed by Dr. Abercrombie than by most other late British writers, to derangement of the chylopoietic viscera as a cause of hydrocephalus. Disease of the brain in unhealthy children, he admits, may appear in connection with that of the liver or other abdominal organs; but the latter, he thinks, cannot correctly be said to be the cause of the former; on the contrary, he looks upon both as a common result of a tendency to chronic or scrofulous inflammation. When we consider, however, the close and unquestionable sympathy which exists between the head and the digestive organs, and take along with this the greater exposure of the latter to irritating causes and consequent functional derangement, we are disposed to think that the now very generally received opinion as to the frequent origin of hydrocephalus in abdominal disorder is well founded. Dr. Abercrombie, indeed, himself admits that the more acute affections of the bowels have some pretensions to be considered an occasional cause of the disease, though even here the connection is, he thinks, very obscure: and the secondary affection in some of them arises, perhaps, merely out of the general febrile excitement. In admitting the precedence of the derangement of the digestive organs and its occasional connection with disease of the brain, all that is of any practical importance is conceded. How this connection is to be explained matters little. The comatose state in which inflammation of the mucous membrane of the bowels in infants about the period of weaning often terminates, is a striking instance of this origin of cerebral derangement. A remarkable diminution of the urinary secretion frequently precedes the oppression of the brain, and may possibly sometimes, as Dr. Abercrombie has suggested, be in some degree connected with it.

Under the title of "Erethysm or Irritation of the Brain in infants," Dr. Whitlock Nichol has described a state which, as it is accompanied by no increased determination of blood to the head, is distinct from inflammation, though, it may, if neglected, terminate in it. It seems, consequently, to be one of the forms in which the precursory symptoms of hydrocephalus occasionally present themselves, and in which they appear to depend on a peculiarly irritable state of the nervous system. "It is a state," says Dr. Nichol, "in which inordinate effects arise from ordinary impressions upon different parts of the nervous system." The child is wakeful, irritable, and attentive to every sound and every object of sight, and is easily startled; the eye is very sensible to light; there is frequent sneezing; and repeated winking or a firm spasmodic closing of the eyes is occasionally observed. A frequent, sudden cry, without any obvious cause: clenching of the fist, with the thumb laid across the palm; throwing back of the head, and a degree of opisthotonos, are amongst its occasional symptoms. The temperature and pulse may be sometimes raised, but are for the most part natural. Scrofulous children are the most prone to this affection. It may be called into existence by any irritation of the extremities of the nerves, as by painful dentition, by disorder of the liver or alimentary canal, by surgical operations, ulcers, burns, or suppressed discharges. Great wakefulness in infants should always excite attention, as it is very apt to terminate in inflammation of the brain. Children in whom this alarming symptom appears should be carried out much in the open air, and have the head sponged daily with cold water, and the bowels kept in a free state. If it still persist, and we can detect any evidence of undue determination of blood to the head, leeches must be employed. If, on the other hand, the watchfulness and increased sensibility of the nervous system exist simply, small doses of Dover's powder are recommended by Dr. Nichol, and should be repeated at intervals of five or six hours, so as to procure a sufficiency of sleep. We believe, however, that when the bowels are duly attended to, and care is taken to give the child the advantage of air and exercise, the aid of narcotics need rarely be had recourse to; and till every other method of inducing sleep has been tried and failed, we should certainly not advise their exhibition.

Though hydrocephalus in its advanced stages presents considerable uniformity in its symptoms, yet so great a variety is there in its manner of commencement, as fully to justify Quin in styling it a truly proteiform affection. These varieties have been reduced by Dr. Cheyne to three principal ones, which may be respectively entitled the gradual, the rapid, or violent, and the secondary, under one or other of which most of the cases met with in practice are reducible.*

First or gradual Form of Attack.—It is in this form that the precursory symptoms, into which we have entered with so much detail, are the most obvious. The disease here comes on by slow degrees, and at its commencement its true nature is involved in considerable obscurity. The child is indisposed for many days or even weeks, complaining from time to time of slight pain in the head or belly, together with which there is anorexia or capricious appetite, and evident derangement in the functions of the abdominal viscera. It is all this while somewhat feverish and dispirited; its colour fades, and the eye becomes dim. A dragging of one of the legs, or a painful stiffness in the back of the neck, has sometimes been observed from the very commencement. The pain in the head soon becomes severe, returns at shorter intervals, and is complicated with vomiting, which, as well as the headach, is much aggravated by motion. By these symptoms the fears of the friends are at length awakened. The child now seems unable to support the weight of the head, sighs frequently, and looks dejected: the eyes are pained by a strong light, the pupils much contracted, and flashes of light are occasionally complained of. The derangement of the abdominal functions is indicated by the white tongue, by costiveness, or the unnatural appearance of the stools, which are at first of a clay colour, but gradually become gelatinous and of a dark-green hue, and have a peculiar heavy smell. The pulse becomes rapid, and frequent exacerbations take place, characterized by increased heat and irritability, with flying pains in various parts of the body, in the nape of the neck or limbs, the chest or abdomen. This first stage usually lasts for ten days or a fortnight, the patient gradually becoming weaker and much altered in appearance, unsteady in his motions, and fretful.

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* Hopfengärtner has made a division of hydrocephalus into three varieties, which coincides very nearly with that of Cheyne, viz. into, 1st, the *nervous*, which at its commencement strongly resembles a low nervous fever: 2d, the *inflammatory*, characterized by high fever and evident congestion of the head: 3d, that which succeeds to *scarlatina* several days or weeks after the disappearance of the eruption.

Second or rapid form of the Attack.—The disease here assumes a more acute and turbulent form. After a brief period of indisposition, which has possibly been overlooked, the fever appears suddenly and violently, with only short and irregular intermissions. There are frequent flushings, severe headach, occasional brilliancy of the eye, with increased sensibility of the retina, and indeed of the whole nervous system, and frequently pain in the abdomen, and tenderness on pressure.

It is this form of hydrocephalus which bears so strong a resemblance to fever as often to have been confounded with it. With proper care they may, however, be usually distinguished. "We are led to suspect," says Cheyne, "some deeply seated evil from the frantic screams and complaints of the head and belly, alternating with stupor, or rather lowness and unwillingness to be roused; and we are struck with the great irritability of the stomach, which exists in a degree beyond what we generally find it in the fevers of this country, retching and vomiting being brought on by a change of posture, and certainly by every attempt to sit up in bed; and the disordered state of the bowels which attends this irritability of the stomach is also remarkable. And when at any time the child has a little respite from the violence of these symptoms, we find our suspicions confirmed by his look; for when the features do not express pain or terror, there is not unfrequently a vacancy of look, the eyes being set with an expression of dejection which is peculiar to certain diseases of the brain."

Third form of Attack.—When hydrocephalus supervenes upon other diseases, as upon scrofula or painful dentition, the exanthemata, remittent fever, or hooping-cough, it is called metastatic or secondary. When it ensues in the course of an acute disease, its approach is most insidious. The symptoms of the early stage are almost all absent, and palsy and convulsions often afford the first evidence of the brain having become implicated. Even pain in the head is occasionally never complained of; and Dr. Quin alludes to a case in which not one characteristic symptom of hydrocephalus had occurred, and yet a large quantity of fluid was discovered in the ventricles.

Of these three modes of commencement, the first is the most frequent. The second occurs perhaps seldomer than either of the other two, but is the most regular in its progress, and presents the different stages the most distinctly marked. It answers to what Gölis has called the *tumultuous* form of hydrocephalus; and to Guersent's *hydrocephale ataxique*. It is the most acute variety, and Gölis thinks it the most amenable to the influence of medicine, both because it occurs in the healthiest children, and because, being often ushered in by sudden fever and severe convulsions, it is apt to excite attention in its commencement, and thus has more frequently the benefit of early treatment. But if the critical moment for the employment of active measures be lost, in a few days, or sometimes even in a few hours, effusion and palsy ensue. Recoveries from the third form are very rare, which is ascribed partly to the progress which the affection of the brain has usually made before there is any suspicion of its existence, and partly to the debility produced by the previous disease often rendering active treatment inadmissible.

Stages of Hydrocephalus.—The great variety and complexity of the symptoms of hydrocephalus have led most writers on the subject to attempt their simplification by distributing them into separate groups characteristic of successive periods of the disease. Dr. Whytt, struck by the remarkable differences which the pulse presents in the progress of this affection, has assumed it as the ground-work of a division into three stages, in the first of which the pulse is quick, in the second slow and irregular, whilst in the third it rises again, and becomes rapid and feeble. By Gölis four stages have been described, founded on the presumed pathological condition of the brain at successive periods of the disorder. These are, first, the period of turgescence, which answers nearly to what we have called the precursory symptoms; second, the period of inflammation; third, that of effusion; and, lastly, that of palsy. But two stages, on the other hand, have been admitted by Frank and by Conradi; what Gölis calls the stage of turgescence being by them considered as merely indicative of the approach of the disease, whilst the two last stages of Gölis and of Whytt, not appearing to them to be really distinct, have been consolidated into one. The threefold division of Whytt appears, however, to have practical advantages sufficient to justify us in retaining it. It is that which has been adopted by Cheyne in his valuable essay: but in naming these stages, he has proceeded on a different principle from Whytt, characterizing them by the state of the nervous system instead of that of the circulation. Thus, the first he calls the period of increased sensibility, the second that of diminished sensibility, and the third that of palsy or convulsions. "In the first stage," says he, "every stimulus produces an impression more than proportioned to its common effects. There is generally a great aversion to light and to sounds; there is watching, sickness, pain, and a quick pulse. In the second stage, the child is not easily roused, his pupil is dilated, his pulse slow; he is lethargic, with obstinately costive bowels. In the third stage, which perhaps might be considered as a continuation of the second, there is squinting, rolling of the head, raving, stupor, convulsions, with a rapid thready pulse."

Many cases do, it must be confessed, present themselves which set these and all other artificial divisions at defiance, cases in which the most careful observers fail in detecting any thing like a succession of regular stages. Thus convulsions, in place of first occurring near the end, occasionally usher in the disease; and as to the pulse, we have ourselves found it keep high during the whole course of the illness; whilst others have met with cases where it never exceeded the natural standard; and others, again, instances of its being remarkably slow at the very commencement of the attack.

First Stage.—The morbid phenomena of this period are so variable, that it would perhaps be impossible to give any description of it answering accurately to all cases. Amongst the symptoms most frequently present are pain in the head and eyes, occasionally alternating with pain in the abdomen, in the limbs, or in the nape of the neck. There is usually a certain degree of fever, with great restlessness and total inability to sit up for any length of time. During the sleep, which is very disturbed, there is frequent grinding of the teeth, and the child often awakens with a scream of terror. The head feels hotter than natural, the conjunctiva is occasionally slightly injected, and the pupil usually closely contracted. There is a manifest aversion to light and noise, with other indications of increased sensibility of the nervous system. The intellect is often but little impaired, for replies, though unwillingly made, are usually correct. The symptoms of disorder in the digestive organs are numerous. The nostrils are always dry, and the lips cracked. The tongue is for the most part slightly furred, and the breath has a faint sickly smell. There is usually complete anorexia, but often less thirst than would seem consistent with the degree of feverishness present. Vomiting very frequently occurs, and is aggravated extremely by the erect posture, or by carrying the child out of bed. The epigastrium and hypochondria are often tumid and slightly tender on pressure, but in the progress of the disease the belly usually falls in, and becomes flaccid, though no proportional increase in the stools has taken place. There is commonly a great tendency to constipation; and evacuations, when procured by medicines, are generally of a dark greenish spinach-like appearance. The occurrence of such discharges does not depend, as many persons have asserted, on the employment of calomel, as they often exist before a single dose of this medicine has been given, and are frequently procured also by other purgatives. We have not, however, by any means found them invariably present. Their peculiar colour has been attributed to morbid bile, but there is reason, as we shall afterwards see, to doubt whether this be universally the cause. The urine is deficient in quantity and turbid, with a whitish sediment; it is often retained or suppressed for a great many hours, and dysury is not unfrequently complained of.

The functional derangement of the respiratory organs is manifested by the occasional cough, the irregular breathing and moaning, and by that deep sighing which is almost pathognomonic of affections of the head. The pulse is considerably accelerated, and is very excitable. An occasional irregularity and slight inequality in the force of succeeding strokes may be discovered as the second stage approaches. The skin is dry and of an unhealthy colour. An eruption of almost imperceptible vesicles, which become, however, more obvious towards the latter part of the disease, now occasionally manifests itself. They occur chiefly about the mouth, cheeks, and forehead, the outside of the humerus, and the upper part of the chest. They were first pointed out by Formey of Berlin, and have been subsequently noticed by Gölis, Raimann, Schmalz, and other German pathologists. Though these writers speak of this eruption as an almost invariable occurrence in hydrocephalus, it has attracted little attention in this country, where almost the only mention of it that we have met with is that by an anonymous writer in the second volume of the Edinburgh Medical and Surgical Journal, who says that it has been considered as a certain sign of approaching death. Whilst on the subject of the skin, we may mention that ecchymosed and gangrenous spots have been observed near the close of fatal cases, and we have at the same period remarked a few large-sized vesicles scattered over the body at distant intervals.

The duration of the first stage varies according to the acuteness of the attack, from a few hours to a week or more.

Second Stage.—The pulse, which had been gradually getting weaker, now becomes irregular, of unequal force, very variable, and unnaturally slow; yet it is still liable to be greatly accelerated on the slightest exertion, or when the patient is taken out of bed, or even placed in the sitting posture. The slow pulse is accompanied with a gradually increasing heaviness and torpor, and the head is now generally less complained of, though this is by no means universally the case. Squinting and impaired or double vision now occur along with dilatation and immobility of the pupil, an oscillatory state of the iris occasionally preceding its permanent retraction. The child lies with the eyes half closed, in a soporose state, which is interrupted from time to time by exclamations of suffering extorted by the momentary increase of pain. The sickness and vomiting often now diminish; appetite occasionally seems to return, the child greedily swallowing any food which is presented to it; but the bowels still continue obstinately bound, except while under the influence of powerful purgatives. The stools as well as the urine are passed unconsciously. The hands, which are tremulous and unsteady, are frequently raised to the head and back of the neck; and the child is almost incessantly picking at its nostrils, lips, or hair. Spasmodic winking or a fixed stare, a stern or a desponding expression, often rapidly succeed each other. There is great emaciation, and frequent partial suspirations indicative of extreme debility and of irregularity in the distribution of the blood.

The soporose state is now often suddenly and unexpectedly dispelled, the child recovering the use of its senses, and noticing and even taking an interest in surrounding objects. But this deceitful calm is usually of short duration, and is followed within one, or at most two days, by a deeper state of coma than before. The shrill piercing scream, which is so characteristic of hydrocephalus, occurs chiefly in this stage; and during its continuance the pulse becomes almost innumerable, and the cheeks suffused. The duration of the second stage may be variously stated at from one to two weeks.

Third stage.—A feeble attempt at re-action now manifests itself, the pulse again rising and attaining to a height which is scarcely equalled in any other disease. We have counted it as high as two hundred in a minute, and Whytt once found it it even so high as two hundred and ten. Convulsions in every degree, from slight spasmodic twitching of the face and vibratory motion of the eye-balls up to violent contractions of the muscles of the trunk and extremities, take place, and are usually soon followed by paralysis of one side, the opposite side continuing to be convulsed at intervals. The child lies raving and insensible; moaning and sighing, waving the unpalsied hand through the air, and rolling its head from side to side on the pillow. The cheeks are alternately flushed or pale; the eye half closed, as if from partial paralysis of the levator palpebrarum; the conjunctiva bloodshot, and the cornea dim and covered over with a slimy secretion; the pupil is dilated, the teeth grind violently together, or there is a frequent smacking of the tongue and lips. The balance of the circulation is lost, the skin being dry and burning in some parts, and drenched with partial but profuse perspiration in others. The feet grow cold, the pulse gets weaker and weaker, the respiration unequal and stertorous, and a violent convulsion often closes the scene.

The length of the third stage is even more uncertain than that of the two preceding, varying from a few hours to one or even two weeks.

The duration of the whole disease, where the elements of which it is made up are so variable, is necessarily very uncertain. It may be stated approximatively at from two to three weeks, but it is generally nearer to the latter than the former. There has, however, been the greatest difference of opinion as to the time the disease lasts, arising partly from the variety which actually exists in different cases, and partly from the difficulty, in those cases where hydrocephalus is grafted on a previous disease, of ascertaining precisely the period at which it originated. Fothergill, Cheyne, Gölis, and the majority of writers think it usually runs its course in less than twenty-one days; whilst Whytt, on the other hand, has attributed to it a period of from four to six weeks, and Frank has mentioned a case which lasted the longest of these periods. It seems to be considerably influenced in this respect by age, as in very young infants it is often over within a week; and Coindet has mentioned one instance which terminated fatally within three days. A still more rapid species, in which effusion and death take place within a few hours from the commencement of the attack, has been described by Gölis under the name of the water-stroke, (wasserschlag,) or hyperacute hydrocephalus, which may, according to this writer, be either an idiopathic affection, or else the consequence of the repulsion of some of the exanthemata, or of the suppression of some cutaneous discharge, (as that from crusta lactea, tinea, sore ears, &c.) or of the sudden and imprudent checking of a diarrhœa, dysentery, or perspiration. The precursory symptoms in this variety are either absent or so slight as to escape notice; and the stages of inflammation and effusion seem to be almost coincident, the fluid being poured out at the very onset of the disease. Such a disorder rarely leaves any time for treatment, and it terminates almost invariably in death. On dissection, a fluid more turbid than that usually found in hydrocephalus is detected in the ventricles. Of the cases of hydrocephalus appended to Gölis's work, the most rapid was one which terminated fatally in twelve hours; in the majority death seems to have occurred about the seventeenth or eighteenth day. Springel has assumed fourteen days as the average duration. When the disease makes its attack in a very violent form, infants may be cut off by convulsions in its very commencement.

Prognosis.—Hydrocephalus has always, and with too much reason, been considered a very fatal disorder. It does not, however, as some would have us believe, universally and necessarily terminate in death. Since its diagnosis in the earlier stages has become more accurate, and its inflammatory nature in the majority of cases been generally recognized, patients have been saved much more frequently than formerly. Recovery has been known to take place after the occurrence of all the most decided symptoms of the disease; slow pulse and stupor, strabismus, dilatation of the pupil and blindness, convulsions and paralysis. In Dr. Cheyne's essay numerous instances of recovery under the influence of judicious and energetic treatment are detailed. At Geneva, according to Odier, about eighteen children on an average are attacked by it yearly, and of these about six, or one-third, recovered. Of the eleven cases recorded by M. Brichteau, four recovered; of Dr. Mill's twenty-eight cases, seven; and of the thirty-seven given in Gölis's work, five had a similar termination. In the whole practice of the latter physician, which has been unusually extensive in the diseases of children, forty-one cases of recovery from hydrocephalus have been met with, these were, however, very early seen, and being subdued in the inflammatory stage, have been thrown in his tables under the head of inflammation of the brain. These results are very gratifying to those who feel an interest in the progress of medical science, and form a pleasing contrast to the desponding views of Whytt and Fothergill, and the other early writers on the disease. "So long," says Dr. Cheyne, "as the pulse continues steady and the breathing natural, we are not to be prevented by the most alarming symptoms from an employment of active remedies." A very few instances of what may almost be called spontaneous recovery, so inefficient was the treatment employed, are to be met with in medical writings, and must still farther encourage our exertions on the behalf of those labouring under the disease. Willan speaks of an infant which recovered in the fifth week of its illness, though its case had been abandoned by the medical attendants as hopeless. No medical man who has a due regard for his own character or for the feelings of the friends of a hydrocephalic patient, should desert a case of this kind at any stage, however unpromising it may be. Under circumstances apparently desperate, a temporary or even permanent amendment will sometimes most unexpectedly take place; and if a new medical attendant has been called in, what is perhaps only the effect of an effort of nature will be set down to the credit of his superior penetration and more judicious measures. After effusion has occurred, the disease is generally supposed to be utterly hopeless; but such a dogma should be allowed to exert no influence on our practice, both because it seems unwarrantably to limit the powers of nature, and because we possess no unequivocal signs from which we can certainly conclude that such effusion has actually taken place; for all the symptoms usually attributed to it may, it is now well known, be produced by inflammation alone.

In forming our prognosis, much attention must be paid to the state of the pulse and of the excretions. If the pulse, from being very quick, falls slowly and moderately, the prognosis must be more favourable than where it comes suddenly down; the former showing a diminution of fever, whilst the latter might imply that the second stage of hydrocephalus was about to establish itself. Inattention to this point in suspicious febrile cases has often led practitioners into disagreeable mistakes; the fall of the pulse inducing them to give a very favourable prognosis, and pronounce the disease at an end at the very moment it was about to assume a new and fatal aspect. Where the pulse, on the other hand, has already become unnaturally slow, a slight increase of frequency may be considered a favourable circumstance; whilst a rapid and very considerable rise would point to the commencement of the final stage.

An increased facility in procuring stools, an improvement in their appearance, a plentiful secretion of urine, a profuse warm perspiration, or a running from the nose, are to be considered promising circumstances. It is on the latter of these evacuations that the vulgar reckon most, and empirics often take advantage of their credulity to exhibit powerful errhines, a practice which is said, we know not how truly, in some rare instances to have been successful. We must beware, however, of attributing too much importance to any single symptom: thus we have known a profuse perspiration about the head and neck occur though the disease was rapidly hastening to a fatal conclusion. Indeed partial perspirations here, as in most other cases, are generally to be looked on with a suspicious eye: in the stage of palsy they are the usual forerunners of death.

If under the influence of powerful medicines or otherwise, an intermission of symptoms for two or three entire days takes place, we may entertain good hopes of recovery; but unfortunately this cessation is rarely so prolonged. In the great majority of cases the truce is a brief and fallacious one, the irregularity of pulse, headach, vomiting, &c., recurring in a few hours, and the disease proceeding rapidly to its fatal termination. Even in cases of apparent recovery we must not be too sanguine as long as the pupil continues dilated, or contracts but sluggishly on exposure of the eye to a strong light.

Where the acute disease supervenes on the chronic, the prognosis is very unfavourable; not indeed on account of any irritating or corroding quality which the effused fluid has, as some of the German writers fancy, contracted, but on account of the almost irremediable nature of the exciting cause and the debilitated state of the constitution generally. Where it occurs during the slow and imperfect convalescence from an acute disease, or develops itself in the course of hooping-cough, infantile remittent, or painful dentition, or succeeds to some scrofulous affection or other tedious disease by which the powers of the constitution have been greatly reduced, recovery very rarely takes place. This is attributable in some of these instances, partly to the extreme difficulty of detecting the disease of the head in its incipient stage, and partly to the debilitated state of the patient not admitting of the employment of those active measures which the nature of the local disease requires. That variety which occasionally occurs as a sequela to scarlet fever is generally more within the influence of medicine than the other kinds alluded to above. On the other hand, that which occurs in the early stage of this disease or of the measles usually assumes a very violent form, and is, as we have already stated, almost always rapidly fatal.

Amongst the possible terminations of acute hydrocephalus is its passage in the chronic form; but this is extremely rare, and is scarcely to be desired, being very liable to be accompanied with blindness or deafness, idiocy, epilepsy or paralysis, or some other lamentable impairment of the functions of the nervous system, arising from the serious injury which the brain has undergone. Such consequences are, however, not universal. Guersent mentions a case which, having become chronic, got completely well on the spontaneous occurrence of a cutaneous eruption, and that too after all the ordinary means of treatment had proved ineffectual.

It has appeared to Dr. Cheyne that hydrocephalus is more frequently cured when it occurs in such constitutions as have a decided predisposition to it, which may always be presumed when several individuals of the same family have been successively attacked. This apparent paradox is perhaps only explicable on the supposition that previous losses dispose and enable parents more early to detect the incipient symptoms of the disease, and thus lead to the employment of an appropriate treatment at that period when medicine is most likely to be of any avail. Success has by some been thought most probable in those cases which come on slowly and gradually, and thus afford ample time for treatment. According to Abercrombie and Gölis, on the contrary, those are the most favourable in which the symptoms indicate very active inflammation, and admit of energetic treatment; whilst the least promising cases are those where the inflammation is of the low or scrofulous kind. "In all," says the first of these writers, "the period for active practice is short, the irremediable mischief being probably done at an early period of the disease."

Diagnosis.—There is perhaps nothing more characteristic of this affection of the brain than the rapid fluctuations which the several functions of the body undergo, and that often within a very brief space of time. This mutable condition is indicated in the cerebral functions by the state of the intellect and senses, now unnaturally acute, again dull, and at times altogether obliterated. The muscular system is at one moment unaffected save by debility, and the next moment perhaps convulsed or paralysed. The pulse and capillary circulation are constantly varying under the influence of slight or inappreciable causes, the face being at one moment flushed and at the next deadly pale, whilst heats and chills, perspiration and dryness of the surface, rapidly alternate. The respiration likewise undergoes endless changes in force and frequency. The functions of the digestive organs are equally variable, anorexia and incessant vomiting being succeeded by an apparent insensibility of stomach, or a ravenous and indiscriminating appetite.

Of effusion having actually taken place, there is, as we have already stated, no symptom, nor even set of symptoms, which can afford us *certain* evidence. Somnolence, strabismus, convulsions, and partial paralysis, which were once so much confided in, have lost much of their credit since pathological anatomy has been more diligently cultivated; and numerous cases are now on record where they all existed though no water was found on dissection. Coma, immobility and dilatation of the pupil, and blindness, and sundry other symptoms which have been supposed by later authorities to be more worthy of reliance, will also frequently deceive us as far as effusion is concerned: their true value consists in fixing attention on the state of the brain itself. When we recollect that the effusion is a mere result or consequence of the disease, and reflect on the complicated state of cerebral derangement which often precedes or coexists with it, the difficulty of recognising it with certainty during life will cease to surprise us. In a practical point of view, moreover, it is of less importance than is generally imagined. It is not the effusion, so much as the morbid state of the parts within the cranium which leads to it, which is the legitimate object of treatment: over the former, when it already exists, many doubt whether medicine can exert any influence.

The difficulty of distinguishing hydrocephalus in its earlier stages from many of the febrile affections to which children are liable is often very considerable. We may generally avoid confounding it with the infantile remittent fever by attending to the extreme irritability of stomach, and its aggravation by the erect posture and by motion—the greater severity and constancy of the headach—the disposition to somnolency, the child often falling asleep the moment after it has been replaced in bed, or after it has been answering our questions—the knitting of the brows and aversion to light and noise, the pupil being at first contracted and subsequently unnaturally dilated—the caution in moving the head, and the frequent raising of the hands to it—the thrusting back of the neck—the variability and extreme excitability of the pulse—the green stools or obstinate costiveness. The morning remissions moreover, if they occur at all, are much less marked in hydrocephalus than in the infantile remittent. Amidst our efforts to establish a diagnosis in any particular case, we must not forget that diseases are at times, in the language of the older writers, convertible into each other; or that, to use the more moderate phrase, complications may arise in their course, and the secondary affection eventually predominate over the original. It is thus that in the course of infantile fevers hydrocephalus frequently comes on, and often with such insidious advances as altogether to elude observation almost up to the very moment of its fatal termination; we confess we have even remained doubtful as to the existence of the disease within the head till the scalpel revealed its presence. Where infantile remittent is about to pass into hydrocephalus, the remissions become gradually less and less distinct. Pain is in some cases never complained of.

Fevers of a typhoid type are comparatively rare in children, and when they do occur can scarcely, with ordinary attention to the symptoms, be confounded with hydrocephalus. Gölis has, with a truly German patience, been at the pains of drawing a long parallel between the two diseases. The more equable pulse, the diarrhœa with dark and fetid stools, the trembling tongue, petechiæ, and low muttering delirium, the tumid belly, supine posture, and sliding to the bottom of the bed, to say nothing of the absence of all the more striking symptoms of hydrocephalus, will scarcely suffer us to confound a case of typhus with even the obscurer examples of the former disease.

In connection with low and protracted fever, symptoms frequently occur, as has been remarked by Abercrombie, which seem to indicate serious affection of the brain, and yet these shall all disappear as the fever subsides. Thus he gives a case of a child labouring under a tedious disorder of this kind, accompanied with stupor, blindness, dilated pupil, and squinting. After lying speechless for near a month, it gradually recovered after a copious discharge of matter from one of the ears. We think it probable, however, that the essential part of hydrocephalus, namely, inflammation in the central parts or at the base of the brain, was present here, and that the fever was throughout only symptomatic, and its cessation attributable to the escape of pus from the external meatus.

A want of correspondence in the symptoms has been pointed out as one of the marks of this disease of the brain. Thus, when the headach is greater or more permanent than accords with the degree of fever, and especially if the pain increases in intensity as the pulse falls, our suspicions should be awakened. Brichteau dwells on the slightness of the thirst and its total disproportion to the fever. This, however, is by no means invariably the case. Many children labouring under hydrocephalus drink largely, so that M. Brachet, another French writer, has even considered the extreme avidity with which they seize the vessel containing their drink as one of the most remarkable symptoms of the disease.

The frequent and deep sighing and the peculiar scream, such as might be uttered under the agonies of a severe surgical operation, are also very characteristic of the disease.

Severe pains appearing successively in different parts of the body, and for which we cannot in any way account, should in children as well as in adults always excite suspicion, and make us turn our attention to the nervous system, and especially to the state of the organs contained within the cranium and spine.

The diagnosis is peculiarly difficult in feeble children who have been exhausted by long previous illnesses, as scrofula, painful dentition, or chronic disorders of the digestive organs already attended with vomiting. Quin met with a case of acute hydrocephalus which proved fatal in seven days, in which there was no evident division into stages, no dislike of light, nothing characteristic in the pulse, no dilatation of the pupils, nor any violence of headach; and Rush alludes to similar cases.

In very young infants the detection of the disease in its early stage requires the closest observation. Long-continued wakefulness, or starting from sleep with a cry of alarm, or prolonged screaming without any obvious cause, should always awaken our apprehensions; and when the infant subsequently lies moaning and drowsy, and rolling the head from side to side on the nurse's arm, or thrusting it back against the pillow; when there is frowning and aversion to light, a contracted state of the pupil, and unusually frequent vomiting, our suspicions are almost converted into certainty. The negative indications also, or the absence of well-marked disease in the chest or abdomen, will frequently throw additional light on the nature of the case. The face, as has been remarked by Cheyne, is expressive rather of uneasiness than of acute pain; nor is there the extreme violence of temper, or the alternate throwing out and drawing up of the legs which accompanies colic and griping pains in the bowels. "In no other infantile complaint do we observe the same knitting of the eye-brows unaccompanied with crying. The head hanging over the nurse's shoulder, and the half-closed eye-lids, are also alarming symptoms." Where convulsions, together with strabismus, dilated pupil, blindness, and a comatose state, have already taken place, the nature of the case is but too evident. Convulsions, as we have already stated, sometimes occur even at the commencement of the disease; no one, we believe, at the present day considers them ever to be a purely idiopathic affection; whatever may be their exciting cause, they indicate serious functional derangement of the nervous system, and what was originally perhaps only sympathetic disorder, may, if neglected, terminate in organic disease. When convulsions or spasm of the glottis, which may be considered as a modification or local species of them, resist the ordinary means for correcting disordered states of the digestive organs and improving the general health, we should suspect a tendency to disease of the brain, and take our measures accordingly.

A readiness in detecting that species of hydrocephalus which occurs some days or weeks after an attack of scarlatina, is peculiarly desirable, both because it is an affection by no means of rare occurrence, and because, if taken early, it is the most manageable perhaps of all the forms of dropsical effusion within the head. The first symptom which warns us of its existence is severe headach; and if this be neglected, convulsion, loss of sight, and a comatose state soon follow. Like the general anasarca which usually accompanies it, it is a truly inflammatory affection, and may be often speedily arrested by the use of active antiphlogistic measures. It is most to be dreaded when it makes its advances in a slow and insidious manner. The sudden disappearance of the anasarca, when unaccompanied by any increase in the evacuations, occasionally gives rise to this affection of the head.

A lethargic state, with irregularity of the pulse and dilatation of the pupil, occurring with or without fever, occasionally depends on constipated bowels, and vanishes rapidly on the exhibition of an active purgative; but it is highly probable that such cases, if neglected, would often pass into confirmed hydrocephalus; for we cannot agree in opinion with Willan and Underwood in thinking that cases, though they possess all the characteristic symptoms of hydrocephalus, yet are not really allied to that disease, provided they yield to the free use of purgative medicines. Dilatation of the pupils has sometimes seemed to depend on the presence of worms in the intestines.

In all cases of doubt it is safer to lean to the supposition of the disease being hydrocephalus, and to treat it as such. From this, even though we should be in error, little inconvenience can arise; whilst, on the other hand, if we wait until unequivocal symptoms of the disease in its confirmed state have developed themselves, all our efforts at checking its further and fatal progress will too often be of no avail.

Dr. Gooch has described a peculiar state of the brain occurring in infants which has usually, but erroneously, been attributed to congestion of this organ; whereas it seems really to depend on the very opposite state, or a deficiency of blood in it. It is in children of from two months to two or three years old that it usually makes its appearance, and generally in such as are small and delicate, and have been exposed to some previous debilitating cause. The leading symptoms consist in heaviness of the head, drowsiness, and languor. There is an absence of heat and of all the symptoms of fever, the skin being occasionally even colder than natural. The tongue is slightly white, and a transient flush at times passes over the cheek. There are no signs of pain. Under the antiphlogistic treatment usually pursued in acute hydrocephalus, consisting of leeches, cold applications, purgatives, and especially calomel, all the symptoms become aggravated, the child growing colder and more languid, the pulse quicker and weaker, and death by exhaustion takes place after a few days; whilst, on the contrary, several have recovered under the use of an abundant supply of light nourishment, and the cautious employment of ammonia and other stimulants. In two cases only did he observe symptoms of oppressed brain, coma, stertor, dilated and motionless pupils; and this was only for the last few hours before the fatal termination. On dissection, the brain is found pale and bloodless, with no other morbid appearance than perhaps an increased quantity of serum in the ventricles. The late Dr. Armstrong has applied to an affection in many respects very like that just described, the name of "hydrocephalus from venous congestion;" whilst by Dr. Darwall it has been called asthenic hydrocephalus.

The disease, however, to which the term hydrocephalus is, by the majority of writers of the present day, conventionally restricted, is so different from this passive effusion, as well in most of its symptoms as in the treatment which it requires, and in the morbid condition of the brain discovered after death, that no benefit, we think, can arise from comprising both under the same name. The term, in regard to its derivation, is, we admit, equally applicable to each; but this only shows the impropriety of having named them, not from any thing essential, but from an effusion which may be present or absent in both, and is consequently characteristic of neither.

The above described morbid condition in infants has also been noticed by Dr. Marshall Hall, who was generally able to trace it to the diarrhœa of weaning, or to leeching from some previous complaint, or some other cause of exhaustion. He too, like Gooch, believes that it is often mistaken for "hydrencephalus, or inflammation of the brain." There is at first, according to his observation, great restlessness with irritability of temper, pale and anxious countenance, and frequent pulse; dozing and deceptive appearances of amendment succeed; but the pulse continues to rise, the cheeks and the extremities grow cold, the voice and cough husky, and the patient soon sinks exhausted; — a termination which may, however, be often averted by a proper supply of nourishment and a cordial soothing plan of treatment. Dr. Abercrombie, in like manner, in the last stage of diseases of exhaustion has seen both adults and children, but especially the latter, fall into a state resembling coma for a considerable time before death: the pulse still continuing to be distinctly felt, though feeble; the face pale, the pupils dilated, and the eyes open, but insensible. He has known children, after lying for a day or two in this kind of stupor, recover under the use of wine and nourishment. This state, which seems to correspond very nearly to the apoplexia ab inanitione of the older writers, is supposed by Dr. Gooch to consist in impairment of the nervous energy, or deficient cerebral circulation. Profuse hemorrhage is well known to be capable of producing dilatation of the pupil and blindness; and when animals are bled to death, convulsions very usually occur, and more or less serous effusion takes place in the brain, as appears from the experiments of Dr. Leeds.

Appearances on Dissection. — There is sometimes, in consequence of previous inflammation and adhesion, considerable difficulty in separating the skull-cap from the dura matter, and the former is occasionally thinner, more transparent, and of a bluer colour than usual. When we come to examine the state of the parts within the cranium after death, we usually find the vessels on the surface of the brain in a state of considerable congestion. A net-work of florid vessels is occasionally observed in the pia mater, and even patches of extravasated blood, indicative of high inflammatory action, are occasionally detected. This membrane at times also adheres more strongly than natural to the brain. An effusion of serum underneath the arachnoid, and filling the space between the convolutions, is very frequently observed. When it is considerable in quantity and of a yellowish hue, it might be mistaken by a superficial observer for a gelatinous effusion. In some instances it has a sero-sanguinolent character. Opacity and thickening of the arachnoid membrane, and depositions of coagulable lymph, or more rarely of puriform matter on its surface, or between it and the pia mater, are amongst the more commonly observed morbid appearances, and prove unequivocally the inflammatory nature of the affection. These occur especially at the base of the brain, about the pons varolii and decussation of the optic nerves. That these and many other characteristic morbid appearances should have escaped observation in the slovenly manner in which the brain used too often to be examined by slicing it from above downwards in situ, is not wonderful. Before commencing the dissection of the brain itself, it ought to be removed altogether from the skull and inverted into a plate, so as to enable us accurately to examine the important parts at its base.

Adhesions between the opposite surfaces of the arachnoid through the medium of false membrane, are sometimes, though rarely, observed. The arachnoid is occasionally covered, especially when it lines the ventricles, with minute granulations, which give it a rough appearance. They are probably one of the many forms which the effused coagulable lymph assumes, and require a good light for their detection. We must not confound with these granulations the bubbles of air which at times exist between the pia mater, and which may be distinguished by their vanishing on raising this membrane.

The mass of the brain itself, in some rare instances, has appeared evidently infiltrated with serosity. Gölis mentions such a case, in which the fluid could be expressed from the cerebral substance as if from a sponge; and Cheyne also has noticed this appearance of increased moisture on making sections of the organ.

A frequent appearance is that of an unusual number of bloody points in the cut surface of the brain, indicating a considerable increase in its vascularity.

The substance of the brain in acute hydrocephalus is generally softer than natural; and this is especially observable towards the central parts. Yet in some cases, and especially in those which run a very rapid course, it is found to have retained its usual firmness.

In most instances the ventricles contain a considerable quantity of fluid, which is usually more limpid than that found in the other serous cavities. Sometimes, however, it presents a turbid, wheylike, or puriform appearance, with shreds of coagulable lymph floating in it, as well as lining the walls of the ventricles; and this is particularly the case in the most acute and rapid examples of the disease. The existence of a fluid may often be predicted before we have punctured the ventricles, from the feeling of fluctuation communicated to the finger applied to the surface of the hemispheres, as well as from the flattening of the convolutions. The quantity of water varies from a few tea-spoonsful to seven or eight ounces; four or five ounces may be stated as the average. Of this the greater part is contained in the lateral ventricles, the posterior horns being usually much enlarged, and the anterior portion of the fornix elevated so as to make the opening of communication very free with the third ventricle, in which, as well as in the fourth, and in some very rare instances also between the layers of the septum lucidum, the effused fluid is likewise found. The choroid plexus is very generally remarkably pale. Small vesicles, not unlike hydatids, are occasionally found attached to the pia mater; and we have seen such adhering to the choroid plexus. They seem to owe their origin merely to a circumscribed sub-arachnoid infiltration; the serous membrane being detached by the effusion at a given point, and distended into a small cyst.

The septum lucidum, the fornix, and other parts forming the walls of the ventricles, are often found in a state of softening, being of a pulpy or occasionally even of a creamy consistence, whilst the lining membrane of these cavities displays equal evidence of inflammation by its opacity, as well as by the layers of coagulable lymph with which it is at times overspread. A lacerated opening in the septum lucidum occasionally exists, and forms a new and unnatural communication between the lateral ventricles. We have seen the infundibulum and the cellular membrane in the structure of the pituitary gland distended with serous effusion into the form of a little bladder. This, by its direct pressure on the optic nerves, in addition to that to which they are exposed from the lymph effused at the base of the brain, and from the dilatation of the ventricles, must tend to complete the derangement of the functions of vision.

Laennec has spoken of minute tubercular granulations dispersed through the brain, and discoverable by a careful microscopic examination; but as their existence has not been confirmed by subsequent observers, it is probable they are at most only a casual occurrence.

Other morbid appearances, of a date anterior to the hydrocephalus, and occasionally, no doubt, its cause, such as tubercles or abscesses in the brain, caries of the petrous portion of the temporal bone, &c., not unfrequently co-exist, and should be carefully sought for.

With regard to the nature of the effused fluid, it differs somewhat from that found in the other serous cavities, being for the most part not coagulable by heat or acids; this is, however, by no means universally the case, a slight coagulation having in some instances been detected by Dr. Baillie, Dr. Blackall, and others. It has been carefully analyzed by Marcet. Of 1000 parts operated on, 990·80 were water; 1·12 muco-extractive matter, with a trace of albumen; 6·64 muriate of soda; 1·24 sub-carbonate of soda, with a vestige of an alkaline sulphate; ·20 phosphate of lime, with traces of phosphate of magnesia and of iron. Acids or heat, according to this chemist, did not produce any decided coagulation.

It has been already stated that abdominal affections often complicate hydrocephalus, that they frequently precede it, and are probably not very rarely its exciting cause. On dissection, unequivocal examples of disease in the viscera of the abdomen have been detected in too many cases to be considered a mere casual coincidence. Thus the liver has been found enlarged, and presenting evident traces of inflammation on its surface, and adhering through the medium of organized lymph to the neighbouring parts. Tubercles on its surface or in its substance, as well as in that of the spleen and mesenteric glands, are occasionally observed. We have found the mucous membrane of the stomach and intestines inflamed, the patches of Peyer's gland much developed, and such firm contraction of the intestinal tube as to give it in parts the appearance of a solid chord. This spasmodic state, when existing in the large intestines, enables us to account for the great difficulty which sometimes attends the administration of enemata during the latter part of the disease. We have likewise met with intus-susception of the small intestines, an appearance of which has been alluded to by several writers on the disease. The spasmodic state of the intestines which is thus evinced is probably in some degree analogous to the convulsive actions in the voluntary muscles, and takes place like them under the influence of the morbid state of the brain; at least, they do not seem to be attributable solely to the irritation in the mucous membrane, both because such extreme contraction is not usually observed in instances of uncomplicated inflammation of this membrane, and because we have found it greatest in those parts of the intestines which presented least appearance of inflammation. We have noticed a similar constriction of this canal after death by tetanus, where there existed no inflammation of the intestines.

The peculiar green colour of the stools in hydrocephalus has been attributed to their union with the morbid bile. We were first led to entertain doubts of this opinion being universally correct, and to ascribe the appearance in question rather to a morbid secretion from the glands of the intestines themselves, by observing that the peculiar porraceous tinge was not acquired in perfection till the fæces had reached the lower part of the small intestines, the contents of the upper portion being of a pale drab colour, whilst the bile in the gall-bladder was of a yellow colour, and without any tinge of green.

The assertions of Dr. Cheyne as to the frequency of disease in the liver and intestines have been corroborated by the subsequent observations of Dr. A. T. Thomson, Mr. Cooke, and others. In eleven dissections of patients dead of this dis-case, Dr. Thomson found traces of inflammation of the liver in nine, inflammation of the colon in the tenth, and intus-susception of the jejunum in the remaining one; whilst in three out of Mr. Cooke's four cases the liver was found diseased. Dr. Wilson Philip's experience leads him to the conclusion that five out of six cases of hydrocephalus arise out of the derangement of the digestive organs; and Abernethy has mentioned three cases of hydrocephalus in all of which the liver and bowels were notably diseased.

Though evident traces of inflammation in the brain or its membranes are detected in a very large proportion of cases, yet there are a few in which a trifling effusion of serum in the ventricles or under the arachnoid is the only morbid appearance discoverable; there being neither congestion of the vessels nor effusion of coagulable lymph, nor softening of the central parts of the brain, the whole organ being as firm and perhaps even paler than in its natural state. Such is, as we have already stated, usually found to be the case in infants who have died with the symptoms of passive effusion previously described. M. Bricheteau, in the *Archives Générales* for the year 1824, has described a case where most of the usual symptoms of hydrocephalus had existed; and yet, on dissection, a limpid serous fluid in the ventricles was almost the only thing detected, and was not by him thought to be the result of inflammatory action: by many, however, we believe it would have been considered as an instance of low inflammation in the arachnoid. Of late years, since pathological investigations have been conducted in a more careful and methodical manner, it has been much more rare to hear of cases which, having possessed the whole assemblage of symptoms characteristic of acute hydrocephalus, yet present on dissection no indubitable marks of inflammatory action. Guersent candidly confesses that amongst his earlier dissections he has notes of many such cases in which no allusion to inflammatory appearances is made; but that, as he became more accurate in his mode of examining the brain, the instances in which proofs of their existence could be detected became infinitely rarer.

Theories of the Disease.—The uncertainty which has prevailed as to the true nature of acute hydrocephalus has given rise to a corresponding diversity of opinion as to the appropriate place for it in systems of nosology. It was long confounded with apoplexy, till Whytt, by a closer investigation of its symptoms, became convinced that it was much more nearly allied to chronic hydrocephalus. Cullen, who at first classed it along with chronic hydrocephalus, in a later edition of his nosology made it a species of apoplexy, under the name of apoplexia hydrocephalica. By Macbride it was placed along with fevers, under the name of febris nervosa hydrocephalica; and a similar view of it was taken by Pinel in the earlier editions of his Nosographie Philosophique, in which it bears the name of cerebral fever; but he subsequently restored it to its old place amongst the dropsies: there is, however, usually no evidence of any dropsical diathesis, effusion into the other cavities, or swelling of the face or limbs, scarcely ever co-existing with it. The investigation of the disease by Quin and Rush, proceeding on the basis of pathological anatomy, the only solid groundwork of nosological arrangement, led to a more correct conception of its nature, and demonstrated its affinity in a great majority of instances to the phlegmasiæ. Subsequent inquiries, both in this country and on the continent, have tended to confirm the justice of this manner of considering the subject, and have proved that the effusion is almost always a secondary phenomenon occurring in connection with obvious morbid changes in the brain or its membranes, and in a very large proportion of cases demonstrably the results of inflammation. So fully convinced is Rostan of the effusion being always consecutive to cerebral or meningic lesions, and never constituting an essentially distinct disease, that he proposes that the term hydrocephalus should be altogether expunged from our tables of nosology. As the effusion and other morbid appearances are such as to indicate inflammation of the serous membrane, the disease has been treated of by several foreign writers under the head of arachnitis of the ventricles and base of the brain; whilst others, conceiving that inflammation of the cerebral structure itself often precedes that of the membranes, have referred its symptoms to the head of cephalitis. Thus, by Conradi it is called "encephalitis exsudatoria infantilis," and by Coindet, "cephalite interne hydrencéphalique."

That the effusion does not constitute the most important feature in the disease, and that it is not indispensable to the production of any of the symptoms which characterize hydrocephalus, we have a double proof; first, in the occasional absence of these symptoms where effusion to a considerable extent is detected on dissection; and secondly, in their being sometimes present, and that in a very marked degree, when an examination of the brain after death has shown that no effusion had yet taken place. There is sometimes even reason to think that the inflammatory tension is temporarily relieved by this increased action of the exhalent vessels: this can, however, be the case in those instances only where the effusion is moderate. Where it takes place rapidly, and to a considerable excess, it cannot fail to add still further to the derangement of the cerebral functions, and to manifest its presence by symptoms indicative of compression under some circumstances, and of irritation under others. We cannot, therefore, concur in opinion with a late writer, who supposes that the increasing fluid, by stimulating the brain, may occasionally answer a beneficial purpose, and give rise to that momentary recovery of the senses and of the intellect which so often takes place before the fatal termination. Such fleeting and fallacious indications of improvement in the state of the cerebral functions should perhaps rather be attributed to a temporary diminution in the quantity of water in the ventricles under a casually increased action of the absorbing vessels. This partial re-absorption of the aqueous effusion, some time previous to death, is rendered probable by the instances of a similar diminution of effused fluid in the extremities and other parts of the body lying open to our observations, being by no means rare in dropsical subjects at this period. It is only to some change in the state of the effused fluids, or of the circulation within the brain, that we can look for an explanation of this fact; for as to the alterations of structure and consistency which have occurred in any portion of the cerebral mass or its membranes, it is inconceivable that they should undergo any sufficiently rapid modification to account for it. As to the presence of absorbing vessels in the brain, so long a subject of dispute, the changes which are now so well known to take place in the apoplectic coagulum cannot leave a doubt. The occasional diminution of the effused fluid in chronic hydrocephalus under the influence of pressure or other methods of treatment, is also conclusive on the same point. Indeed the analogies in favour of the existence of such vessels within the brain are so strong, that it seems wonderful that there ever should have been any scepticism on the subject. It is altogether inconceivable that the fluid, which even in a state of health always lubricates the serous cavities within the cranium, should, unlike that in the thorax or abdomen, be stagnant and incapable of removal. Cheyne suggests that the effused fluid may answer the usual purpose of supplying the place of the cerebral matter removed by absorption, thus giving support to the brain, and enabling it in some degree to continue its functions; and hence he conceives that any sudden withdrawal of the water, so far from being desirable, might even have a fatal effect.

Morgagni was one of the first pathological anatomists who pointed out the very frequent dependence of effusion on organic disease of the brain; and Portal has likewise long since insisted on the very secondary importance of the latter in determining the indications of cure. The belief in the inflammatory nature of hydrocephalus, since it was first promulgated by Quin and Rush, has been slowly but steadily making its way both in this and all other countries where medical theories are in any degree under the influence of morbid anatomy. Dr. Garnett argued in favour of this view of the disease from the buffy state of the blood, the acuteness of the pain, the character of the pulse, the benefit received from antiphlogistic measures early employed, as well as from the aggravation ensuing upon the use of stimulants, and finally from the appearances found on dissection. Similar views were followed up with great industry and ability by Dr. Cheyne, who showed that the opinion of Fothergill, who attributed the effusion to the rupture of a lymphatic vessel in the brain, as well as that of Whytt, who ascribed it to a watery state of the blood, or to a laxity of the exhalents, and that of Darwin, who thought it consisted in a debility of the absorbent vessels, were all hypothetical and untenable; whilst he proved by numerous carefully made dissections that dropsical effusion here, as in so many other cases, is, to use the language of Heberden, not so much a disease in itself as a symptom of one. The opinion of Cheyne seems to be, that hydrocephalus owes its origin, in the first instance, to inflammation; that this gives rise to a morbid accumulation of blood in the head, or venous congestion; and that effusion is the ultimate result. Occasionally the concatenation of morbid actions can be traced still farther back: thus there is often, first, disease of a distant part, then increased irritability, which is soon attended by increased arterial action, absorption of the substance of the brain, venous congestion, and finally effusion. "There is no proof whatever," says the above-named writer, "that the effusion into the ventricles is the cause of any of the violent symptoms."

The greater or less quantity of fluid found in the ventricles in acute hydrocephalus seems to depend on the length of time which the patient has continued to live after the commencement of the second stage. Though the state of the disease may undergo some modification by the occurrence of effusion, yet there is much reason to believe that some degree of inflammation exists to the very end. Cheyne, although a strong advocate for the inflammatory nature of hydrocephalus, by no means goes the length of Dr. Rush, so as to believe it merely a modification of phrenitis. He points out, on the contrary, with his usual accuracy, many striking marks of distinction between the two diseases, deduced from their causes and symptoms, from the ages respectively prone to each, as well as from the morbid appearances found after death. "Hydrocephalus," he concludes, "appears to consist in a diseased action of a peculiar kind, but of what kind we can as little explain as we can the nature of the scrofulous or syphilitic action."

According to Abercrombie, hydrocephalus is originally an inflammatory affection; in its most ordinary form seated chiefly in the substance of the central portions of the brain, and terminating generally in ramollissement of those parts, combined with serous effusion into the ventricles. It may, however, prove fatal, and have all the symptoms commonly considered as those of hydrocephalus, without any effusion. Thus we occasionally observe coma of long continuance, though on dissection no such cause of it is detected; and on the other hand, effusion has been unexpectedly found, though coma had never manifested itself. Again, even when the symptom does exist, it may sometimes be entirely removed by purgatives and other antiphlogistic measures, and yet the disease proceed uninterruptedly to its fatal termination. In the cases which have been published by the same able physician, we meet with every variety in the state of the pulse, the vision, and the intellectual functions; so that we can obtain from none of these sources indubitable evidence of effusion having taken place. Though inflammation of the central parts of the brain constitutes the most frequent modification of hydrocephalus, he admits that it may take place in connexion with inflammation of other parts of this organ, or of the membranes which envelope it. He has noted but two instances in which he did not succeed in demonstrating other inflammatory appearances besides the effusion of serum; and in these the disease presented itself in the most insidious and chronic form, and offered a remarkable contrast to the active symptoms of what he considers the usual species of the disease. As to the serum, he believes, that even though it were absorbed, the patient's condition would be little improved, as the softening or disorganization of the brain would remain behind. In a word, the coma and other symptoms of hydrocephalus are the effect, not of the effusion, but of that morbid condition of the brain of which it is itself the consequence.

Lallemand conceives that the inflammation in hydrocephalus may commence either in the cerebral substance, and subsequently extend to the membranes of the brain, and thus induce effusion; or, on the other hand, begin in the arachnoid, and extend, after a longer or shorter period, to the brain; but of these two origins he considers the latter by much the most frequent. In their earlier stages he believes that they may often be distinguished from each other. The possibility of their commencing simultaneously in some cases, in both these parts, under the influence of a common cause, must not, however, be forgotten. Inflammation of the membranes, according to Lallemand, is characterized by restlessness, insensibility, convulsive affections and delirium; whilst that of the cerebral substance itself may be recognised by the gradually extending paralysis, the rigidity and pains in the limbs, together with the impairment of the memory and intellect. Inflammation of the brain itself has a rapid progress, and is speedily mortal. Hence, when the symptoms of hydrocephalus depend on inflammation of the cerebral substance, they are more severe, and the disease runs a shorter course. In several cases such inflammation has existed in the septum lucidum, fornix, and other central parts of the brain, without extending to the arachnoid where it lines the ventricles, and consequently without effusion, and yet all the symptoms of hydrocephalus have been present. Hence, he argues, it is highly probable that even in those other cases where effusion does exist, it has much less concern than the state of the neighbouring parts in producing the characteristic symptoms of the disease. From erroneous views on this subject too little attention has, he thinks, been paid in the treatment to the ramollissement, and the efforts of practitioners have been too exclusively directed to promoting the absorption of the effused fluid.

The investigations of MM. Martinet and Parent-Duchâtelet have shown that inflammation of the arachnoid at the base of the brain is much more common in infancy than in adults. In the latter, inflammation of this membrane occurs more frequently in that portion of it which covers the upper and lateral parts of the hemispheres, and is characterized at first by delirium, to which a soporose state and at length coma succeed; whereas in the arachnitis of infants there is a greater tendency to convulsive affections and less to delirium.

[Dr. D. D. Davis, of the London University, maintains, that acute hydrocephalus is an inflammatory disease, and that it is curable equally and by the same means with other diseases of inflammation. (*Acute Hydrocephalus or Water in the Head, an Inflammatory Disease.* Amer. Med. Lib. edit. Philad. 1840.)]

The inflammatory nature of the great majority of cases of hydrocephalus has also been recognised in its fullest extent by Gölis, Conradi, and almost all of the German pathologists of the present day. Formey, however, a very respectable authority, thinks that the frequency of effusion into the ventricles during childhood depends not on inflammation, but merely on a state of increased activity in the vessels of the brain, which accompanies its rapid and premature development; but Raimann with much reason believes that in addition to this state, the existence of true inflammation, either of an acute or chronic kind, is indispensable.

[Of late years, by many pathologists the acute hydrocephalus of authors has been regarded as *tubercular meningitis.* According to MM. Barthez and Rilliet, (*Traité Clinique et Pratique des Maladies des Enfants*, i. 550. Paris, 1843,) M. Papavoine is probably the first who established the tubercular nature of this form of meningitis. (*Journal Hebdomadaire*, vi. 113. Paris, 1830.) Afterwards, MM. Fabre and Constant presented a memoir on the same subject, which was "crowned" by the Institute. In 1835, Dr. Gerhard, of Philadelphia, (*American Journal of the Medical Sciences*, Nov. 1835,) and M. Rufz, (*Thèse de Paris*, 1835,) published their observations on the subject. An inaugural dissertation by M. Piet, published in 1836, is highly spoken of by MM. Barthez and Rilliet. These gentlemen regard tubercular meningitis or acute hydrocephalus to be characterized anatomically as follows:—*First.* By a deposition of tubercular matter in the meshes of the pia mater, presenting itself in the form of flattened or round granulations disseminated in different parts of the hemispheres or base of the brain, often not larger than a pin's head, most frequently opaline or white, sometimes grey; semitransparent; commonly isolated, sometimes congregated;—in very rare cases, the granulations being the sole meningeal lesion. *Secondly.* By inflammation, characterized by a secretion of concrete pus or of false membranes in the pia mater, which is thickened, yellowish or greenish, friable, and sometimes adherent to the cerebral surface. This phlegmasia most commonly coincides with the tubercular granulations of the meninges. In rare cases, it is entirely independent of them. It commonly occupies the base of the brain. In 27 of 33 patients, MM. Barthez and Rilliet found the tubercles or granulations and the phlegmasia of the pia mater associated; in four cases, the meningitis was not accompanied by any tubercular production of the encephalon; in two cases, the granulations or meningeal tubercles had not occasioned any phlegmasia. In all these cases, however, the symptoms were nearly identical. *Thirdly.* By a peculiar state of the arachnoid, which renders it slightly glutinous or fishy to the feel. *Fourthly.* By a white, creamy softening of the central parts of the brain, occupying, in the majority of cases, the septum lucidum and fornix, seldom extending to the inferior parietes of the ventricles. *Fifthly.* By an effusion of serum into the ventricles, varying from two to four fluid ounces, and, at times, in much greater quantity. *Sixthly.* By a deposition in the organs of tubercular matter, generally at a slightly advanced stage, or when it has assumed the acute form.

It may be proper to remark, that patients unquestionably present themselves with all the symptoms that are ascribed to acute hydrocephalus, without any tubercles being present in the brain or its meninges; whilst, on the other hand, it is affirmed by Dr. P. Hennis Green, tubercles may exist without there being any cerebral or other phenomena, that could give occasion to more than a suspicion of their existence, and in some cases not even to that.]

Causes.—Of the predisposing causes, the pe riod of life seems to be one of the most influential; hydrocephalus being very much more frequent during infancy and childhood than at any subsequent period. The rapid evolution which the brain is then undergoing, and the great proportion of blood sent to the head, appear to be the causes of the peculiar tendency to cerebral inflammation which characterizes this age. The more early and rapid the development of the cerebral organs, the greater is the risk of hydrocephalus. Its connection with precocity of intellect is indeed matter of daily observation, and large-headed children are generally found to be the most subject to the disease. The latter fact, indeed, is doubted by Underwood, but both Gardien and Guersent confirm the popular opinion. The greatest number of cases appear from the tables of Percival and of Bricheteau to occur between the second and fifth year; but at the same time it is not infrequent in infants at the breast, or, indeed, in children of any age up to the twelfth or fourteenth year: after this period it is less common. A scrofulous habit predisposes strongly to the disease. The greatest number of cases occur in constitutions evidently of this kind. When a strumous tendency exists, all the children of a family have been known to be thus swept off in succession as they approached a certain age. Hydrocephalus and scrofulous affections seem to be mutually convertible into each other, the disappearance of scrofulous disease of the glands or joints being frequently followed by the development of hydrocephalus; while, on the other hand, all the symptoms of confirmed phthisis have been known to vanish on the occurrence of the latter affection. The disease has usually been thought to take place most frequently in children with a fair skin and hair, pink complexion, and blue eyes. Cheyne, however, says that he has seen it oftener in those with dark eyes and dark complexion. As scrofula occurs pretty equally in both these temperaments, it is probable that hydrocephalus also is nearly as frequent in one as in the other.

Disorders of the digestive or respiratory organs, difficult dentition, scarlatina, measles, and other diseases which induce debility or excite febrile action in the system, may, according to the intensity of their action, be placed either amongst the predisposing or the exciting causes. The frequent and indiscriminate use of calomel in children's complaints has been accused by Blackall of predisposing to the disease. This, however, can apply only to the abuse of this remedy; judiciously employed it is of the greatest utility in cutting short such indisposition as might, if neglected, terminate in hydrocephalus. The pernicious habit practised by some unprincipled nurses, of giving narcotics to infants in order to quiet them and render them less troublesome—a practice which cannot fail to derange the functions both of the digestive organs and of the brain, has been noticed as an occasional cause of this affection. Belladonna, which is much and advantageously employed in Germany as a remedy in hooping-cough, and also as a preventive of scarlet fever, has sometimes, in imprudent hands, led to inflammation and effusion within the cranium. We have seen hydrocephalus apparently induced by the abominable custom, unfortunately not very uncommon amongst the lower classes, of giving spirits to children.

Great terror and anxiety in the mother during the last months of pregnancy has been placed by Gölis in the list of predisposing causes, in support of which he adduces the fact, that a great proportion of the children born soon after the bombardment of Vienna by the French in 1809, were seized with convulsions within a month after their birth, and died of inflammation within the cranium; effusion of coagulable lymph on the membranes, and of serum in the ventricles, being discovered on dissection. The same writer conceives that the frequent exhibition of emetics in catarrhal or other affections may occasionally lead to the disease in scrofulous children. We are not aware, however, that any facts in confirmation of these opinions have been observed in this country.

To the list of exciting causes enumerated above, we may add external injuries, such as falls or blows on the head, the extension of inflammation from the external ear to the brain. The sudden suppression of accustomed discharges, or drying up of sores behind the ears or eruptions about the head, without an appropriate modification of diet, or the simultaneous employment of suitable evacuations, are also amongst its occasional causes. However erroneous may have been the explanation of the facts afforded by the humoral pathology, their reality and importance are indubitable, and will be least questioned by those who have attended the most closely to the powerful influence of counter-irritation in controlling morbid determinations of blood to internal organs, and in subduing their tendency to inflammation.

Treatment.—The chances of success in the treatment of hydrocephalus depend in a great measure on the period at which it is detected. It is during the precursory symptoms, or the commencement of the inflammatory stage alone, that the influence of remedial measures can be reckoned on with any thing like confidence. It may be said that at so early a period we can have no certainty of the disease being actually incipient hydrocephalus: in dubious cases, however, it is infinitely more reasonable to assume the affirmative, and take our measures as if the presence of this formidable affection were fully ascertained, than to remain inactive spectators of its progress till the disease has assumed an unequivocal and comparatively hopeless character. When a family has already lost one or more of its number by this disorder, the recurrence of a precisely similar set of initiatory symptoms in any of the remaining children renders an active mode of proceeding doubly incumbent. Under the head of prognosis it has been already stated that cases in every stage of the disease have, under active and judicious modes of treatment, been brought to a favourable termination; and this is sufficient to show that trifling in the commencement, or despondency and the want of energy and perseverance to which it gives rise in the advanced stages of the complaint, are equally unjustifiable. There is too much reason to apprehend that many children have fallen victims, not so much to the incurable nature of their case, as to the indecision of their medical attendant.

The precursory stage being very commonly marked by derangement in the action of the intestines, and interruption or perversion of the biliary secretion, the employment of active purgatives, of which mercury should form a part, is almost always indicated; and we should persevere in their use with the double object of rendering the evacuations natural, and relieving the uneasiness in the head.

Where the threatening symptoms have taken their rise soon after an injury of the head, though it may have been of a slight nature, and the effects be as yet trifling, the employment of venesection, or the application of a few leeches to the temples as a precautionary measure, is advisable, in addition to the use of aperients and a reduction of the ordinary diet.

Where the symptoms in the head undergo no favourable change, though the bowels have been freely acted on, the probability of disease having become established within the brain becomes hourly stronger, and more energetic measures must immediately be had recourse to. The chief indications in hydrocephalus are to reduce the force of the cerebral circulation; to obviate all sources of irritation, whether originating in the abdominal organs or elsewhere, which might re-act on the brain, and thus aggravate, if they did not give origin to, the disease: to alleviate pain, vomiting, and convulsions, even where we fail in removing their cause; to support the strength in the advanced period of the disease; and finally, when death seems inevitable, to render its approach as easy as possible. For fulfilling the first and most important of these indications, our chief resources are to be found in the antiphlogistic class of remedies. Bloodletting, active and repeated purgation, cold applications, mercury, and blisters, are amongst the most accredited remedial agents, and are here arranged nearly in the order of their relative efficacy. The mode of employing these, as well as some additional therapeutic means, remains to be considered.

Bloodletting.—The advantage of early bloodletting in hydrocephalus is more generally agreed upon than that of any other measure whatsoever. The importance of the brain to all the functions of life, and the unyielding nature of the parietes of the cavity in which it is contained, show us, when conjointly considered, how the effusion, which in many other situations is the natural cure of inflammation, must, within the cranium, if it proceed to any extent, be attended with extreme danger. The only safe termination to inflammation here is in resolution; and to effect this, free, early, and in some cases repeated abstraction of blood must be had recourse to. Opening the temporal artery, or copious venesection, either in the arm, or, perhaps, better still, in the jugular vein, often affords immediate relief to the headach, reduces the fever, and causes purgatives and mercurials to act with greater readiness and efficacy.

Dr. Rush practised bleeding in this disease at least as largely as in phrenitis; and the activity of his practice has been equalled or surpassed by that of Dr. Maxwell of Dumfries, with the remarkable result of sixty recovering out of ninety cases, or two-thirds of the whole. The child being placed in the horizontal posture, Dr. Maxwell opens the jugular vein, and stops it from time to time with the finger, so as to prevent syncope taking place, till a very considerable quantity of blood has been obtained; the bleeding is allowed to go on till the pulse altogether disappears: a state of insensibility ensues, and occasionally continues for some hours afterwards. The disease is said to be often immediately arrested by the shock which is thus given to the circulation. But the possibility of death occurring under the very hands of the operator will probably prevent many persons from imitating this bold proceeding; besides, some doubts might be raised even as to the principle on which it is performed being physiologically correct or universally applicable, as excessive losses of blood are known, as already stated, to induce convulsions and effusion even in healthy subjects. The experience of no single individual, however extensive it may be, is sufficient to establish the propriety of such a practice; and certainly the great debility which exists in so many cases of hydrocephalus, seems often strongly to counter-indicate such an extreme measure. Except when the attack is of the very violent kind, with high fever, a strong pulse, and extreme pain and restlessness, the majority of practitioners are satisfied with a single bleeding, and trust subsequently to the repeated application of leeches or to cupping. Cheyne is an advocate for early bloodletting in most infantile fevers of a suspicious character, attended with great irritability of stomach, tumid hypochondria, or suppression of the secretions. He has also adduced evidence of the utility of a moderate bleeding even in the advanced period of hydrocephalus, when pain of the head and vomiting continue to be predominant symptoms; at the same time he is convinced of the inadequacy of this measure singly to subdue the disease at any period of its progress, and believes that its repetition is even at times not unattended with hazard. The pulse must, however, be our guide, as, if it rises in strength, and the symptoms continue or recur, blood may again be abstracted with safety and advantage. By Abercrombie also, venesection is employed in the most decided manner in the acuter forms of the disease; whilst he admits that in those which assume a more chronic character, it has much less control over the disease, and cannot be borne to the same extent. Bloodletting seems to have been practised in some of his cases, and with occasional good effect, even after the occurrence of the slow, varying, and weak pulse of the second stage. The French practitioners generally trust almost exclusively to the free abstraction of blood in the earlier stages of this complaint; and some of them prefer taking it from a vein in the lower extremities, instead of from the arm or jugular vein; but we are not aware that any decisive proofs of the superiority of this mode of bleeding, which is gone into very general disuse in our own country, have been adduced.

Bloodletting has, however, its opponents as well as its advocates, but they are comparatively few in number. Dr. Garnett was averse to the employment of general bloodletting in children labouring under hydrocephalus; and even in adults he usually gave the preference to the local abstraction of blood, both because it appeared to him to exert more influence over the local inflammation, and because he thought it less likely to add to the debility which comes on in the course of the disease. Similar views of the relative value of local and general bloodletting are entertained also by Dr. Porter of Bristol. Such is not, however, the general opinion of the profession; and on a review of such cases as have fallen under our own observation, we have sometimes seen cause to regret that general bloodletting had not been earlier performed, or carried far enough, but never the reverse. That this as well as every other measure will, in a very great proportion of cases, prove ineffectual, we readily admit, as we do not participate in opinion with those who think that hydrocephalic inflammation is always as capable of being subdued by active antiphlogistic treatment, as that induced by injuries of the head in adults, which usually falls under the care of the surgeon. The predisposition and debility of constitution which often exist in the former, render the cases, in many instances at least, widely different.

As to the quantity of blood which may be taken from infants with safety, the most specific directions are those furnished us by the late Dr. John Clarke: his extensive experience led him to the important conclusion that very young children bear well the loss of blood even to fainting, once or twice repeated; whilst on the other hand their powers are apt to sink if it be more frequently had recourse to. Children of four years old and upwards can, however, support the repeated performance of venesection with impunity. In infants of only a year old the jugular vein may often be opened without difficulty. At this period of life three ounces may be considered a full bleeding, and nearly the same quantity may again be taken away in twelve hours afterwards, if the symptoms seem to demand it, and the weakness is not too great. Where blood could not be obtained from a vein, Dr. Clarke gave cupping from the nape of the neck the preference to leeches. Local and general bloodletting should usually go hand in hand. Where the latter measure is, from the age of the child or any other cause, inapplicable, or has already been carried as far as is prudent, it is to cupping from the nape of the neck or to leeches that we must chiefly trust. For an infant of six months old, from four to six leeches, according to the strength of the child and the violence of the symptoms, may be once or oftener applied either to the temples or behind the ears, to the angle of the jaw, or to the nape of the neck; perhaps the latter situation, from its proximity to the medulla oblongata and base of the brain, may deserve the preference. Kuhn recommends their application to the inner angle of the eye, probably with a view to more directly unloading the cerebral vessels. When there is pain, tenderness on pressure, or fulness in the region of the stomach or liver, the application of leeches to these parts should not be neglected.

Purgatives.—Remedies of this class are exhibited in hydrocephalus with the double view of improving the secretions of the mucous membrane and liver, and thus removing one evident source of irritation, and also of producing derivation from the head, and diminishing the quantity of the circulating fluids. By means of calomel given in combination with jalap or compound powder of scammony, or, if those are found to irritate too much, with rhubarb, we shall generally succeed in procuring evacuations. At first these medicines may require to be aided by the occasional interposition of saline purgatives with the infusion of senna, which have the additional advantage of producing abundant watery secretions. Purging actively seems to Abercrombie to be the remedy which is of the most importance in all the forms of the disease; and though he sets a due value on the aid of venesection, he believes that more recoveries from head affections take place under the use of very strong purgatives than under any other mode of treatment whatever. He has found the croton oil one of the most convenient and effectual cathartics in diseases of this kind, which are so often accompanied by great obstinacy of the bowels. Whytt never saw even temporary relief of the symptoms produced by any other means than those which increased the evacuations; and Rush was likewise a strenuous advocate for the employment of medicines of this kind. It is chiefly at the commencement of the disease that active purgatives are proper; but even here there are limits and exceptions to their use. Where there is a high degree of irritability of the mucous membrane of the stomach or intestines, they will be useless or even injurious till these states have been subdued by bloodletting in some of its forms. When in a high state of excitement, we shall often attempt in vain to force the secretions of the liver or mucous membrane; and to procure healthy evacuations under such circumstances is quite out of the question. When the usual purgatives seem to aggravate the vomiting without moving the bowels, or when they produce only mucous stools attended with much irritation, a perseverance in their use cannot fail to be prejudicial. When the commoner purgatives have been rejected by the stomach, or proved insufficient, Dr. Cheyne occasionally succeeded in quieting the stomach and procuring evacuations, by giving a drachm or two of magnesia saturated with lemon juice every second or third hour, venesection to an adequate extent having been usually premised. In other cases he postponed the use of aperients till the state of the secreting organs had been first modified, and some appearance of feculent matter could be observed in the stools, under the influence of a combination of calomel, opium, and antimony. Besides, we must always bear in mind that the local irritation which the excessive or untimely employment of cathartics is capable of producing, cannot fail to re-act on the head, and aggravate instead of relieving the hydrocephalic symptoms So great, however, is the torpor of the intestinal canal in most instances, that such cases are, perhaps, only to be looked upon as the exceptions. We cannot agree with Dr. Porter in condemning active purgation as an inefficient measure, even were his hypothesis granted, namely, that the derangement of the abdominal organs is always secondary, and merely symptomatic of the cerebral disorder.

Purgatives should have a fair trial in conjunction with other antiphlogistic measures during the commencement of the disease; after which, if they do not appear to be making any decided im pression on it, the mercurial plan of treatment may be resorted to, a laxative enema or an aperient medicine being still occasionally exhibited. A large glyster of broth, with some of the purgative salts in solution, repeated frequently in the course of the day, has been found a useful palliative by Cheyne, the child lying at ease for a considerable time after its exhibition. Its good effect is attributable partly to its soothing influence, and partly to its protecting the intestines from the irritating qualities of the morbid fæces.

Cold Applications.—The increased activity of the circulation within the brain may be controlled in a considerable degree by the long-continued application of cold to the shaven scalp, which may be effected either by means of cloths, kept constantly wet with cold water, or evaporating lotions containing spirits and ether; or more effectually still, by means of a bladder containing pounded ice mixed with water, kept in constant contact with the forehead, temples, and upper part of the head. This measure, in conjunction with an erect position of the head and trunk, persevered in for many days together, has been known to exert a surprising influence over inflammation of the brain both in adults and children. But the most efficient method of all consists in directing a stream of cold water against the crown of the head, and continuing it for some moments, till its full effect is produced. This is so very powerful a means of reducing cerebral action, as to demand much circumspection in its employment; and it is chiefly applicable to the more violent examples of the disease. To Burns it appears a measure of rather doubtful propriety, as it is often followed by alarming collapse: he thinks that it is only in the early part of the disease, when there is much heat, and when adequate evacuations have been already premised, that its employment can be safe. Abercrombie, while he admits that its use requires discretion, is a strenuous advocate for its utility in hydrocephalus, and has likewise employed it with great success in sudden coma connected with congestion of the head, and in the convulsive affections of children, in which last it is more effectual and much more generally applicable than the warm bath. Dr. Darwall has known cases which seemed utterly hopeless recover by letting water drop in a small stream upon the scalp, and continuing it till the head no longer recovered its high temperature on intermitting the stream; and Formey thinks it, when repeated every two hours for several days and nights consecutively, the most effectual remedy we possess both in the inflammatory stage and in that of effusion.

Mercury.—It is now nearly fifty years since the first recommendation of mercurials in hydrocephalus by Dr Dobson; but though they have formed a part of the standard treatment of the disease during all the intervening period, the mind of the profession is still far from being made up, either as to the principle on which they act, or even as to their utility. Upon an extensive examination of the subject, the preponderance of evidence seems to be decidedly in favour of their employment. To bring the constitution of young children fully under the influence of mercury is often very difficult, and especially so in this disease; and even when we have succeeded, and the gums and salivary glands have become affected, the case too often runs rapidly on to its fatal termination. A few cases, however, seem unequivocally to have been saved by this remedy; and in many the convulsions and other symptoms have been rendered milder by it, and the senses restored, though the disease has not been eventually arrested, or the patient has been too weak to rally again. The effect of mercury in controlling inflammation and modifying the action of the exhalents in other parts of the body is notorious; and in certain affections of the eye, as every step in the progress of improvement is exposed to view, there can be no doubt as to the reality of its influence. Its first introduction into the treatment of hydrocephalus was grounded on the hope of increasing the activity of the absorbents, and cases have since been recorded where it seems incontrovertibly to have had this effect. Thus in a young child labouring under the disease, where the sutures were not yet closed, Dr. Clarke has seen the fluctuating tumour at the fontanelles gradually disappear under the use of mercury; and numerous instances of recovery by the same means in very advanced periods of the affection, in some of which effusion had in all probability occurred, are favourable to the same hypothesis; as is likewise the influence which it seems occasionally to exert in cases of chronic hydrocephalus.

Considerable embarrassment is often felt as to the precise period at which the mercurial treatment should be commenced. To lay down any invariable rule as to this or any other part of the management of a disorder which appears under so many different forms, is impossible; but to give this practice a fair trial, it must be commenced before the inflammatory stage is very far advanced; and as we are often not called in till the disease has already existed many days, it is frequently necessary, after merely clearing out the bowels and abstracting a due quantity of blood, to proceed immediately to the use of mercury.

Calomel is the preparation usually employed. It may be given in doses of one or two grains, with or without opium, according to the state of the bowels and other symptoms, and is to be repeated every third or fourth hour till the gums become affected, unless griping and diarrhœa be induced by it, in which case the hydrarg. cum cretâ, or the external use of mercury, should be substituted. Gölis, though he has great faith in calomel in the commencement of the inflammatory stage and previously, is averse to the large doses usually given in England, as he thinks he has seen them in some instances produce fatal enteritis, both in this disease and in croup. The dose to which he confines himself is half a grain repeated every two hours, till it produces four or five green slimy stools or colic; and after these effects have ceased, he returns to it again. If the bowels are very hard to move, he combines with it three or four grains of jalap previously toasted, in which state it is less apt to sicken or gripe Children under one year he finds bear larger doses of calomel without colic, diarrhœa, or salivation, than those several years older. His experience here coincides with that of Dr. Clarke, who nove saw salivation induced in children under three years of age save in three instances, though he employed it largely in a variety of diseases.

The corrosive sublimate in minute doses has been preferred by some practitioners, when it is necessary to produce the specific effects of mercury very rapidly. Dr. Merriman, who has succeeded in curing two cases of the disease with this preparation, employs it in doses of from one-thirtieth to one-sixteenth part of a grain repeated every four or six hours, with the effect of producing copious olive-green stools, and an increase in the urinary secretion.

In very urgent cases both the internal and the external employment of mercury should be combined. From half a drachm to a drachm of mercurial ointment may be rubbed into the thighs, or in very young infants more conveniently into the back three or four times a day; and it may also be used as a dressing to blistered surfaces. If in the case of infants this ointment be objected to, calomel may be rubbed into the gums, three or four grains at a time, and repeated every four or five hours.

In whatever form mercury is employed, it is usually requisite to continue its use for a great number of days uninterruptedly; and when either it or any other medicine has produced a favourable change in the disease, its employment should never be abruptly terminated, but on the contrary very gradually relinquished. The only exception, perhaps, to this rule is in regard to digitalis.

Blisters.—The greatest contrariety of opinions prevails as to the period at which blisters should be used, and the place where they ought to be applied. If employed at all in the commencement of the disease, while the inflammatory symptoms continue high, a practice the propriety of which there is much reason to doubt, it should only be to parts at a distance from the disease, as the legs or arms, or between the shoulders, with a view to producing derivation from the seat of the inflammation. In the acuter cases, where there already exist much restlessness and vascular excitement, they can scarcely fail to be injurious till the activity of the circulation has been reduced by adequate evacuation.

In the second stage of the disease, a remarkable alleviation of the symptoms is frequently produced by the application of large blisters to the head or nape of the neck: a number of these may be applied in rapid succession to the vertex and all round the head; or what is perhaps a still more effectual method, the blistered surface may be kept in a state of suppuration for several days consecutively, by dressing it with ointment of savin or of Spanish flies. The dread of strangury has deterred many practitioners from the use of the latter, though perhaps without sufficient reason, as it is possible that the occurrence of such an effect might occasionally even have a beneficial influence on the disease in the head. Tincture of cantharides has been exhibited with the very intention of inducing this species of irritation in the neck of the bladder by Dr. Merriman, in doses of five or ten drops every four hours, and the occurrence of severe strangury has appeared to him to arrest the cerebral symptoms; thus exemplifying the influence of a new and artificially excited disease in controlling the morbid action existing in a distant organ.

When tenderness in the epigastric or hypochondriac regions continues even after leeching the part, a blister may be applied here also with advantage. Gölis thinks that from the sympathy of the head with the stomach, a blister over the latter organ exerts a peculiarly marked influence on the cerebral symptoms; but as blisters often rise but slowly in this situation, he generally applies them in preference to the calves of the leg.

We have thus passed in review those remedies which seem most entitled to confidence in attempting the cure of hydrocephalus. Of these, purgatives, bloodletting, and cold applications belong, as we have seen, more peculiarly to the early or most inflammatory period of the disease—mercury and blisters to the more advanced stages. But the stages often run into each other by such insensible steps, or are so completely confounded together, as frequently to render any division of this kind of very little avail in practice. It remains to say a few words of some other modes of more equivocal efficacy, or which are useful only as palliatives.

Digitalis.—This medicine, first used in this disease by Dr. Withering, and very generally employed since, is given in the earlier stages with a view to aid in reducing inflammatory action, and in the later to favour the absorption of the effused fluid. It is in that variety of the disease which succeeds to scarlatina, that it has appeared to be of most use. It is not, however, without difficulty that we can ascertain when it has been carried as far as is consistent with safety; for in consequence of the irregular state of the pulse, the tendency to vomiting, and derangement of the cerebral functions which already exist as a part of the disease, we are deprived of some of the chief signs by which to recognise the influence of the medicine. What we have seen of its use in this disease has not disposed us to value it highly. Dr. Cheyne, however, speaks rather favourably of it, and has given two cases in which it seemed to be of use. He begins with ten drops of the tincture, and to every succeeding dose, which is generally given after an interval of four hours, he adds two or three drops more than was contained in the preceding one; so that in a day or two some part of the system may be affected. He has thus given as many as one hundred and twenty drops a day to a child only four years old. He thinks that the slow irregular pulse from digitalis may be distinguished by its smallness and sharpness from that of hydrocephalus, which is not only unequal, but more soft and full. "The languor from digitalis is attended with vertigo, and sometimes with *momentary* blindness; that from hydrocephalus has more of coma in its character." Gölis, without appearing to place much faith in its efficacy, gives digitalis both in the inflammatory stage and in that of effusion—in the latter chiefly as a palliative to moderate the violence of the convulsions. He employs it sometimes in the form of infusion, and sometimes in that of the powder, in doses of a quarter of a grain, combined with half a grain of calomel, repeated every second hour. He has not found it exert much influence on the urinary secretion in this disease. Some continental practitioners prefer extensive frictions made with the tincture of digitalis (sometimes combined with that of squills) to its internal employment. In whatever form it is used, if the pulse suddenly become very feeble, irregular, and slow, with increase of vomiting, and frequent recurrence of dimness of sight or blindness for a minute or two at a time, its use should be immediately intermitted, and stimulants, wine, soup, &c., substituted.

Antimony.—The late M. Laennec succeeded thrice in curing acute hydrocephalus by means of the tartrate of antimony given after his peculiar method. In two of them the disease supervened in the course of a continued fever. The subject of the third was a young man, who, after having sat up nightly in attendance upon his sick master for nearly four months, was seized with occasional vertigo and other symptoms which excited suspicion of some incipient cerebral affection. Some time after this he suddenly dropped down insensible, and after continuing in this state five days was brought to the hospital, where Laennec found him pale, motionless, and with the pupils greatly dilated. Leeches were applied to the temples, and twelve grains of the tartrate of antimony were given in the course of twenty-four hours. The next day he was able to move, and uttered some incoherent words. Fifteen grains were now ordered, and on the third day he had completely recovered his consciousness and power of motion, and the pupil had nearly regained its natural dimensions. He was still very feeble. As he had had no evacuation, eighteen grains of the tartrate were prescribed, and some nourishment. On the sixth day he was in a state of rapid convalescence; and crying out for food. Subsequent trials of this plan of treatment have not, we believe, tended to confirm the expectations which these cases (which by the way do not appear to have been very well marked examples of the disease) had raised.

The late Dr. Mills was in the habit of giving rather large doses of the tartrate of antimony, with a view to lower the pulse and relieve the headach; combining it, when the stomach was very irritable, with the tincture of opium. James's powder is, however, the preparation which has been most frequently used; small doses being given either alone, or oftener in combination with calomel, or calomel and opium, or with cathartics, with a view both to directly reducing the inflammatory action in the brain, and to assist in restoring the secretions of the abdominal organs and of the skin. This method of giving antimony is favourably spoken of by Dr. Cheyne. It has also been administered empirically in very large doses, so as to induce profuse perspiration, and it is said at times with success: in the hands of regular practitioners, however, this mode of giving it has failed entirely.

Opiates.—In the second and third stage of hydrocephalus considerable benefit has resulted from the use of opium. It has appeared not only to relieve the pain in the head and calm the general irritability, but also to reduce the morbid irritation in the intestines, and thus lead to an improvement in the stools, to render the pulse fuller and less irregular, and the convulsions less frequent; whilst fortunately it seems in no respect to impede, but rather to favour the action of other remedies. From the eighth to the fourth part of a grain of opium, or three or four grains of Dover's powder, may be given every fourth hour, either alone or in combination with calomel and antimony; or else with hydrarg. cum cretâ if there be great irritability of the mucous membrane. The contraction of the pupil which ensues after the use of opium has been pointed out by Drs. Crampton and Cheyne as affording evidence of the remedy having been carried as far as is safe. Dr. Brooke has recorded a case in the Transactions of the College of Physicians in Ireland, where Dover's powder, in large and repeated doses, proved a very useful palliative. All agree that a moderate employment of opium does not interfere with the action of the bowels. When its use is once commenced, the patient must be kept steadily under its influence; as, if suddenly withdrawn, the symptoms recur with increased violence.

Squills, colchicum, and other diuretics, have been recommended in the advanced periods of the disease. When, however, the stomach is very irritable, we must be cautious in the use of medicines which might aggravate the vomiting, and thus increase the determination of blood to the head. Dr. Warren, indeed, was bold enough to use emetics in hydrocephalus, but in this he has had few imitators. The warm bath, which has in this country been occasionally found a useful auxiliary, is thought by Gölis to determine the blood still more strongly to the head, and thus aggravate the violence of the symptoms. M. Itard is an advocate, in the advanced stages of the disease, for the use of the vapour bath impregnated with vinegar, a powerful means of stimulating the surface and producing an abundant flow of perspiration. At an earlier period, when there is much reaction in the system, M. Recamier, on the other hand, has used the cold bath, and it is said with some benefit. Fomentations to the abdomen when pain is complained of there; stimulating pediluvia, or, what is more convenient and equally efficacious, sinapisms to the extremities, are also frequently had recourse to. Tartar emetic ointment is recommended by Mills, especially in those cases which have succeeded to a repelled eruption.—When applied to the extremities, it has sometimes appeared to produce a very useful derivative action. In a disease in which the unfortunate patient often lingers on for an unexpected length of time in a state of great apparent suffering, a state at all times distressing to friends to witness, and most so when no efforts are made to relieve it, the advantage of a variety of resources during the long and painful attendance is obvious. Recoveries having occasionally taken place under circumstances which seemed utterly hopeless, the medical man who values his own reputation will not resign himself to absolute inactivity at any period of the disease.

Palliatives.—When we fail in subduing the morbid condition of the brain which constitutes the disease, something may still be done in the way of alleviating symptoms, and, even when death seems inevitable, in rendering the steps which lead to it less painful. To enumerate all the measures conducing to these ends would be to repeat much of what has been already detailed. Thus moderate blood-letting, either local or general, according to the degree of strength remaining, will often, even in the advanced stage of the disease, afford considerable relief, without appearing in any degree to accelerate the progress of the disease. Opiates at the same period form an invaluable resource.

Vomiting may sometimes be temporarily stayed by effervescing draughts, to which a few drops of laudanum and ether are occasionally added with advantage. This symptom may also be frequently much relieved by the administration of laxative enemata, to which a nutritive quality may be at the same time imparted.

Convulsions can often be cut short by the affusion of cold water on the head, or even by sprinkling the face and chest plentifully with it; a measure which is at once of easier application, and more frequently successful, than the warm bath. The simultaneous employment of cold to the head and the warm bath is often very efficacious. Musk and zinc in large doses appeared to Odier to have considerable influence in controlling this symptom. When very violent and long continued, the trial of an enema, composed of a very weak solution of tobacco, might perhaps be justifiable. For the mode of employing it, and its utility in an analagous instance, see GLOTTIS, SPASM OF. Where coma is the predominating feature of the complaint, strong coffee or tea have been given in the advanced period of the disease with some appearance of benefit. Retention of urine is often relieved by turpentine enemata or the hip-bath.

The diet in the earlier and more inflammatory part of the disease, should be strictly diluent; but when it has already run on for a number of days, with rapidly increasing debility and emaciation, it becomes a very important object to support the strength. This is peculiarly necessary where the urine, perspiration, or any of the evacuations, has, either by a spontaneous effort of nature or under the influence of medicine, become unnaturally increased. Under these circumstances, beef-tea, jelly, asses' milk, &c., should be freely given. Life has sometimes seemed to be considerably prolonged in this disease under the influence of light stimulants and tonics, wine, small doses of ammonia, quinine, &c. Arnica is a favourite remedy with some German physicians: we need not say how reluctantly and with how much caution such remedies should be had recourse to.

When recovery takes place, the convalescence is often very slow, and requires uninterrupted attention to the state of the bowels, and great care in the regulation of the diet. Asses' milk is here an invaluable article of nutriment, as it recruits the strength without exciting the pulse, oppressing the stomach, or confining the bowels.

If hydrocephalus supervene in the course of an infantile fever, or in a child greatly debilitated by diarrhœa or other previous illness, the treatment presents peculiar difficulties. We are here often unable to venture on general bloodletting, and are obliged to trust to leeches, cold applications to the head, blisters, and calomel, to which opium is to be added if there be great irritability of the mucous membrane or nervous system. Such remedies certainly afford a fairer prospect of success than the arnica, serpentaria, and other stimulants recommended by Kuhn and some other German writers.

Where the head becomes suddenly attacked in a patient labouring under one of the exanthemata, nothing but the most vigorous antiphlogistic measures condensed into the shortest possible space of time can afford even a chance of safety. Venesection or arteriotomy, leeches, ice to the head, or a stream of cold water poured from some height on the vertex, purgatives by the mouth, or if the patient is unable to swallow, active enemata; and stimulating vapour-baths where the eruption has suddenly receded, or sinapisms or blisters to the extremities, should all follow each other in quick succession. The following case from Gölis gives some idea of the rapidly fatal nature of the attack. A child of two years old, on the fourth day from the eruption of scarlet fever, seemed to be going on favourably at eight o'clock in the evening. At midnight it became highly feverish and convulsed; spasms of the muscles of the back and palsy of the right side soon followed, and within ten hours it was dead. We have ourselves seen it fatal on the second day of the attack. Fortunately, however, this may be considered a rare form of the disease. That which occurs in the convalescence from scarlatina is much more frequent. It comes on with giddiness, headach, somnolence, and nausea or vomiting, to which convulsions and all the other symptoms of hydrocephalus are soon added. It demands the prompt employment of bloodletting and purgatives, blisters, and digitalis. Bark has appeared to Dr. Blackall to have much effect in accelerating convalescence.

Prevention.—Where there is reason to suspect a predisposition to hydrocephalus, as is the case with respect to the children of a family which has already suffered by the disease, and perhaps with regard to scrofulous children generally, the earliest attention should be paid to every deviation from the natural state of the functions of the body, and especial care directed to the condition of the digestive organs. To support their tone and that of the whole system by good air, nutritious unirritating diet, and daily exercise, is a point of prime importance. Where costiveness exists, or the stools by their unnatural colour or consistence indicate derangement in the secretions of the liver or mucous membrane of the intestines, appropriate remedies should not be a moment delayed.

An issue or seton in the arm or neck has sometimes seemed to have a remarkable influence in warding off this disease. We know an individual of a family strongly predisposed to it, whose life appeared to have been saved by an issue long kept open in the arm. Though the eighth child of the family, he was the first who survived infancy, the seven older ones in whom this precaution had been neglected having all died of hydrocephalus. Dr. Cheyne, in the work to which we have been so frequently and so largely indebted, mentions some still more remarkable instances of the good effects of establishing an artificial irritation at some distance from the morbidly disposed organ.

The parents and instructors of children of a peculiarly precocious intellect should be made aware of the danger of early and pretracted application. In such individuals it should be our object, if possible, rather to retard than to accelerate the development of the brain and of the mental faculties connected with it; and it is only by postponing the interests of their intellectual to those of their physical education, till the constitution has become established and the period of danger is past, that this object can be attained.

II. **Chronic Hydrocephalus.** — This affection may be either congenital or acquired. When congenital, some malformation or defective development of the brain in many cases coexists. When acquired, it may either come on as the sequel to the acute form, which however is rare, or it may originate insensibly, and attract little attention till the functions of the nervous system and of the body generally become perceptibly deranged by the pressure of the effused fluid. In all its forms it is in the earlier stages of existence, while the brain is undergoing the process of evolution, that it chiefly occurs.

When the cranium becomes very much enlarged, as the face retains its ordinary dimensions, or is even smaller than natural, the visage assumes a singular triangular appearance, and the patient being unable to support the immense head, it hangs on one shoulder or on the breast. The sutures and fontanelles continue widely open, and pulsation of the arteries, as well as the fluctuation of the contained fluid, can be distinctly felt through them. Occasionally, from the unequal yielding of the brain and its membranes, a circumscribed tumour presents itself at some of these openings.

That the dimensions of the head are always increased is the popular belief; and Frank has included enlargement of this part in his definition of the disease. Yet this is far from universally taking place, for the head is sometimes of the ordinary size, or occasionally even smaller than natural.

Gōlis, the best writer on this disease with whom we are acquainted, and Breschet, who usually copies him closely, have divided the disease into three varieties, having relation to the size of the head. The first variety, or that in which the head is enlarged, is either congenital or commences in early childhood. The second, or that in which it is unnaturally small, is always congenital. The sutures are found closed at birth, and the head is of a conical shape. Such children are usually dead-born, or die in convulsions soon after they come into the world. Should they by chance survive a few months, their intellect is totally defective; they are blind, with the pupils greatly dilated, and the eyeballs in constant convulsive motion. They lie in a state of almost total insensibility, with their legs crossed and drawn up to the belly, their toes contracted and feet distorted. Of this variety Gōlis has known but a single instance attain the age of eighteen months. The third variety, or that where the head is of the natural size, is perhaps the commonest of all, as it may take place at any period of life.

In chronic hydrocephalus the intellectual faculties, the senses, and the muscular power all suffer. The patients labouring under it become emaciated, and of a pallid unhealthy complexion, stupid and indifferent to external objects. The countenance is without expression. The senses become successively impaired, the sight being the first to fail. The gait is unsteady, as the power over the involuntary muscles is in a great degree lost.

The following abstract of the symptoms is chiefly taken from the second volume of Gōlis's work, which has not, we believe, hitherto been translated into English.

When the disease comes on at a period subsequent to early infancy, its first approaches are commonly indicated by an unusual excitability of the nervous system. The individual is easily made to laugh or to cry by the slightest causes, is peculiarly irascible, and the temper and dispositions are totally changed. The memory is impaired or lost. The muscular debility is excessive. Epileptic fits, especially at night, are of common occurrence; and on awakening a peculiar piercing cry is often uttered. There is a great degree of sleepiness, together with a dull pain and heaviness of the head. By shaking the head, vertigo or complete stupefaction is brought on. If we make pressure on the fontanelles, a soporose state often accompanied with convulsions is induced. The pupil of the eye becomes larger and larger as the disease advances, and amaurosis usually takes place in the end. Squinting exists in some instances, whilst in others the eyeball oscillates from side to side. The sense of smell becomes perverted or lost. In the former case imaginary odours are complained of; and the nose is at all times itchy and dry. The function of hearing is also impaired. In short, the senses of taste and touch are often the only ones retained, and these occasionally in a very imperfect degree. Violent grinding of the teeth, which are thus worn down to the stumps, is very common. If the patient possess the power of speech, it is for the most part nasal and snuffling, and often interrupted for want of words in consequence of the defective state of the memory. From the mouth, which is usually half open, the saliva is constantly dribbling, either from this secretion taking place in an excessive quantity, or from a diminished power of swallowing. Of the secretions and excretions the saliva and tears are the only ones which do not appear to suffer a decrease.

The functions of the digestive organs are considerably changed from the natural state. The appetite is often voracious; there is frequently a tendency to vomit, and obstinate constipation is rarely absent. The urine is diminished in quantity, and both it and the fæces in the advanced stages of the disease are passed involuntarily.

As the disorder advances, the pulse and respiration become affected, the patient sighs much, and is put completely out of breath by the slightest causes, and paroxysms of suffocative cough occasionally take place. Debility and loss of power over the voluntary muscles is one of the earliest symptoms, and is manifested in the unsteadiness of the gait. Automatic motions of the limbs are common. The posture is much influenced by the disease. When it has made some progress, the erect position of the body can often no longer be borne, as it causes pain in the head, with lightness and stupefaction, and inclination to vomit. There is usually a disposition to keep the head lower than the rest of the body, and not unfrequently a preference is manifested for lying on the belly with the face buried in the pillow. When they lie on the back, the head is often rolled with great regularity from side to side. In the last stage the patient lies gathered up, with the legs crossed and drawn up against the belly, the cervical vertebræ and head being thrown back, whilst the rest of the spine is bent forward. As the disease approaches its fatal termination, the pulse becomes weak, irregular, and intermitting, and the extremities cold and damp. Death takes place either by the supervention of the symptoms of acute hydrocephalus, or by a slow hectic fever, the scene finally closing either with a paroxysm of suffocative cough or with an attack like apoplexy.

Though the impairment of the intellect and senses usually keeps pace with the advancement of the disease, and the subjects of it at length may be said rather to vegetate than to possess an animal existence; yet a few cases are on record, where, though the head had attained a very considerable magnitude, the individual continued perfectly rational and observant of things around him; whilst in other instances again, amidst the general wreck, some one faculty, as the memory for example, has alone escaped uninjured. The moral qualities usually suffer as much as the intellectual, the patient being frequently passionate and revengeful; and every time that a fit of anger is excited, convulsions are apt to follow.

The sexual propensities commonly continue strong, and in several instances, in children of both sexes, a remarkably premature development of the organs of generation has been observed.

Hydrocephalus being a disease of fœtal life, and the unnatural-sized head often presenting a great obstacle to delivery, and frequently even requiring an operation destructive of the life of the child, its early detection would be very desirable. Unfortunately, however, till the head actually presents itself in the progress of delivery, we have no means of detecting its existence. The fact of the mother having previously borne hydrocephalic children should excite a suspicion of its existence in cases of difficult parturition.

The disease may take its rise either before birth or very soon after it, or more rarely during the later periods of childhood. Yet even adult age is not altogether exempt from it. Gölis has mentioned three cases where it came on in old age. Two of the individuals in question were about seventy years old. The third, who was a physician in Vienna, likewise died of it at a very advanced period of life, after having suffered from the disease ten years. In such cases, however, it rarely runs on for more than three years. In cases occurring subsequent to early childhood, no change in the external form of the head is appreciable, for the sutures and fontanelles in most children are found already closed in their second or third year. Occasionally, however, as we learn from Ruysch and Van Swieten, they remain open much longer. We know at present of a child of upwards of six years old, in which the posterior fontanelle is still open; it is of a scrofulous habit, but has hitherto manifested no tendency to hydrocephalus. Dr. Baillie met with a singular case in a boy of seven years of age, where the coronal and sagittal sutures, after having been firmly closed, re-opened to the extent of half an inch and upwards from the pressure of the accumulating fluid. The same author has detailed an instance of chronic hydrocephalus occurring in a man fifty-six years of age, in the ventricles of whose brain six ounces of fluid were discovered. The chief symptoms were pain of the head, and a loss of memory so great that he could recollect but five words, which were continually reiterated to express all his wants. He seemed to retain somewhat of his intelligence. There was no dilatation of the pupils, and the sight was good. The pulse was occasionally rather quick, and never became either slow or irregular. The hemiplegia which existed was accompanied with a permanent rigid flexion of the paralytic limbs, like a fakir. Heberden, on the other hand, has mentioned the case of a man in the ventricles of whose brain, though eight ounces of water were found on dissection, no symptom of hydrocephalus had existed during life.

The **duration** of this disease is very various. When it commences in utero, death almost always occurs very soon after birth; and if it originate in early infancy, the child very rarely survives the third year. Yet the brain in some instances becomes, as it were, reconciled to the pressure of the contained fluid, and existence has thence in a few rare cases been prolonged to adult age. Gölis mentions one in which the patient lived to twenty-seven; Aurivill another which reached forty-five years; and Gall one which attained to fifty-four years of age. In the case of Cardinal, who died in Guy's Hospital a few years ago at the age of thirty-two years, the head was of great magnitude, being thirty-three inches and a half in circumference, and twenty inches and a half from ear to ear. Notwithstanding this immense enlargement, many of the functions of the body were little impaired. The appetite and digestion were natural, and his intellect not remarkably deficient. He was, however, subject to occasional epileptic attacks, especially when costive; and he was unable to walk much, as vertigo was speedily induced by it. For some weeks before his death he was somewhat comatose, though still capable of answering questions when roused: the insensibility gradually increased, and he sunk at length as if apoplectic.

Prognosis.—It is only in the early stage that much can be effected by medicine in this disease. If treatment be deferred till the head has become greatly enlarged, the case is too often hopeless. When it is congenital, or occurs very soon after birth, its termination is, according to the best authorities, invariably fatal. In other cases, Portenschlag, Dreysig, Richter, and Gölis, think it may often be cured, especially if there be no complication, if the disease be early seen, and no great exhaustion has as yet come on. Frank looks upon the disease as very generally incurable. He knew of one case which disappeared on the invasion of a scrofulous affection in another part of the body; and both he and Gölis have seen the breaking out of chronic cutaneous eruptions and sores behind the ears have a very favourable influence over the disease. On the other hand, where any of the exanthemata supervene, speedy death is the usual consequence. Cases originating where there is a scrofulous or syphilitic taint, or after concussion or other accidents by which the texture of the brain may have been injured, have appeared to Gölis particularly unfavourable. Those which arise as a sequel to acute hydrocephalus are likewise very unpromising, as has been already stated. The same may be said of those cases where there is long-continued coma, furious delirium, or frequent convulsions from very slight causes.

Of the **causes** of this disease little is known with certainty. A strong predisposition to it undoubtedly exists in certain families. Thus Frank mentions the circumstance of a mother bearing seven children, all of which were born with this affection: and Gölis another, in which six of the children were born prematurely in the sixth month of pregnancy, labouring under chronic hydrocephalus; and in the three others, which were carried to the full time, it appeared soon after birth. The father being very old or drunken, is thought by the last-named writer to predispose the offspring to the disease; and perhaps intemperance in either of the parents has a similar tendency. A scrofulous habit, and violence done to the head in birth, may also be numbered amongst the predisposing causes. Mechanical injuries, falls, shocks, and blows, are capable of exciting it; as is likewise the sudden repulsion of cutaneous diseases, the suppression of the menses, over-exertion of mind, and long-continued anxiety.

Appearances on Dissection. — The bones, which are usually remarkably thin and transparent, are frequently separated from each other by a very considerable interval. When the patient has lived for several years after the commencement of the attack, nature often appears to make an effort to close the sutures by the establishment of new points of ossification and the formation of ossa wormiana. The thinness of the bones of the skull, though an ordinary, is not an universal appearance. They have sometimes, on the contrary, been observed of unnatural thickness, which, like the supernumerary bones above alluded to, seems to mark an attempt on the part of nature to counteract the effects of disease, and restore to the cranium a proportional thickness. It is supposed that such thick and large skulls on being dug up have been mistaken for those of giants, an error which attention to the comparatively diminutive bones of the face would have prevented. The head of hydrocephalic patients is sometimes of a very irregular form, one side being much more prominent than the other. The effused fluid is found either in the ventricles, or, though much more rarely, in the great sac of the arachnoid. In the former case the ventricles are extremely dilated, the convolutions are unfolded, and the brain converted into a thin membranous-like sac, in which the medullary and cineritious substance can no longer be distinguished. The corpus callosum is much raised, and the septum lucidem occasionally torn or destroyed, so that the brain has sometimes been found forming only one great hemisphere without any central division. The cerebral substance seems denser than usual, and its absolute quantity as compared by weight with that of a healthy individual of the same time of life, in many cases does not present any diminution.

When the water is contained in the sac of the arachnoid, frequently scarcely any appearance of brain can be discovered; or the parts constituting its base, the pons varolii, medulla oblongata, &c., alone exist.

With water in the head and imperfect development of the brain, malformation in other parts of the body frequently coexists. It is now a generally received doctrine that many congenital defects of structure depend upon the continuance of certain states belonging to the earlier periods of fœtal existence beyond their proper time. Thus the fluid which naturally occupies the ventricles during the first steps of the formation of the fœtal brain, by remaining unabsorbed, may lay the foundation of congenital hydrocephalus.

A rare species of the disease is mentioned by Schmalz, in which the fluid is encysted. In such cases the sudden bursting of the sac has led to a fatal result. Gölis met with a cyst of this kind about the size of a goose's egg, situated between the hemispheres, in a child of six years old, who died suddenly, though the bag was in this instance entire.

The quantity of fluid discovered in the head varies from a few ounces to several pounds. Cases in which upwards of ten quarts have been found are on record. In the case some years ago in Guy's Hospital, to which we have already alluded, the bones of the cranium were found on dissection to be of an ordinary thickness. On cutting through the dura mater water immediately gushed out. This was of a pale yellow colour, and the total quantity contained within the head was found to exceed ten pints. At the bottom of the great cavity formed by the immensely dilated skull, lay the brain much flattened. The corpus callosum was defective, so that the ventricles of the brain communicated directly with the great sac of the arachnoid. This was, by some of those present, thought to be a natural malformation, as the convolutions of the brain were not unfolded and obliterated, as in those cases where the effusion takes place originally into the ventricles.

Dr. Baron, in the eight volume of the Medico-Chirurgical Transactions, has given the history of a very interesting case of congenital hydrocephalus. At three months old the head had attained to the enormous magnitude of twenty-nine inches in circumference. About this time a swelling appeared at the posterior fontanelle, and soon acquired the magnitude of a goose's egg. This suddenly became much smaller and soft, and a constant dribbling from the urinary passage was observed, by which the head in three days became so reduced in size, and the integuments were so relaxed, that the skin of the forehead fell in wrinkles over the eyes. The urinary discharge by the end of two months diminishing, the swelling on the top of the head re-appeared. A watery discharge tinged with blood now began to ooze from the nostril and mouth, and flowed most freely when the head was held forward; by this the tumour was again reduced, and the circumference of the head brought down to twenty inches. The child died at eighteen months old. On dissection, the dura mater was found ruptured, a well-defined circular opening nearly an inch in diameter existing in the situation of the tumour, and communicating directly with the interior of the brain. The brain itself, which was expanded into a great sac with very thin parietes, had likewise given way at this part, and thus allowed the fluid from the internal cavity to escape into the outward swelling. A probe passed easily through the æthmoid bone into the nose.

Treatment.—In this disease the unassisted efforts of nature seem incapable of effecting any thing. The indications consist in the removal of the fluid already contained within the cranium, and in subduing the tendency to its further effusion; but unfortunately the resources which we possess will too often prove utterly unavailing towards the fulfilment of either of these objects. Diuretics, purgatives, and diaphoretics, together with mercury, tonics and a strengthening diet, are the internal measures which, singly or conjointly, have been most confided in; whilst, externally, it has been recommended to keep the head warm, to apply aromatic and slightly stimulating embrocations, or to employ severer but more promising remedies, such as blisters, issues, tartar emetic ointment, and even the actual cautery. Local and general bloodletting have also frequently been had recourse to.

Gölis asserts that he has cured the majority of cases when early seen, provided they were not congenital or occurring very soon after birth, by the long-continued use of calomel internally, by the application of a mercurial ointment to the head, which is kept constantly covered with a woollen cap, and by the daily use of stimulating baths.

In more obstinate cases, he has been obliged, in addition to these measures, to employ issues, blisters, or tartar emetic ointment to the head, and under particular circumstances leeches or cupping. In scrofulous habits a tonic plan of treatment must be carried on simultaneously with the above remedies. He has occasionally, also, called in the aid of mild diuretics or diaphoretics, and such measures as appeared to him best calculated to quiet nervous irritation, and to support the strength.

The remedy which has most frequently appeared useful is, unquestionably, calomel. This he gives in doses of half a grain twice a day; and if it purge too much, he reduces it to a quarter of a grain, or even intermits its use for a short time. Whilst employing calomel, one or two scruples of mercurial ointment, combined with an ointment of juniper berries, are rubbed into the head every night. The woollen cap, in which he has great confidence on account of its keeping up a constant though slight counter-irritation on the closely shaven scalp, and at the same time supporting the insensible perspiration, and preventing the sudden cooling of the head, is worn constantly for many months, and even then only very gradually laid aside. Becoming impregnated with mercurial ointment, it must help to bring the constitution more speedily under the influence of this remedy.

Mildly stimulating baths he conceives likewise to have a very beneficial influence, as they tend to excite an extensively diffused though moderate stimulus over the whole cutaneous surface. Alkaline baths may be employed for this purpose. Baths holding tartar emetic in solution, in the proportion of one ounce of this substance to a pailful of water, and gradually made three or four times stronger, have been found by M. Recamier a very useful remedy in this disease, appearing, whilst it reduced the size of the head, to act as a diuretic, and render the patient thinner.

If in five or six weeks some improvement is observed, or if salivation takes place, the calomel and the ointment are to be used only every second or third day. During the whole continuance of the mercurial course an acescent vegetable diet is to be avoided, as being liable, according to Gölis's experience, to cause colic and gastro-enteritis. Infants require no other nutriment besides good breast-milk, whilst for older patients a moderate quantity of flesh-meat is proper. In mild weather they should both be much in the open air. Under this plan of treatment Gölis has known the circumference of the head decrease by from half an inch to an inch in a period of from six weeks to three months, and has frequently seen a perseverance in it effect a perfect recovery both of the mental and bodily powers. When the automatic motions of the limbs cease, and the patient becomes able to hold up the head, to sit up, and even to walk a little, we have evidence that a beneficial change is going forward.

If within two months, on the contrary, no improvement is visible, mild diuretics, such as the acetate of potass or squills, may be associated with the preceding remedies, together with an issue in the nape of the neck, or in both arms, kept open for many months; or tartar emetic ointment or blisters to the same parts, so as to keep up a steady discharge. The use of these measures is particularly indicated when the disease has supervened on the sudden disappearance of a cutaneous eruption. We have known large blisters, applied alternately to each side of the head for many weeks in succession, productive of much benefit. Convalescence, according to Gölis, may be much accelerated by minute doses of the sulphate of quinine, as a quarter of a grain thrice a day.

If acute inflammation of the brain or its membranes supervenes, the antiphlogistic plan of treatment must be put in practice; leeches, calomel in larger doses, blisters to the calves of the legs, &c. Even in the latter period of the disease, when hectic fever has come on, the symptoms have been moderated, and life prolonged by leeches and calomel.

The palliative treatment recommended by Gölis in the advanced and hopeless stages, consists in such medicines as tend to promote the secretions, and to moderate convulsions, viz. aperients, diuretics, and antispasmodics.

As to the propriety of evacuating the water by means of an operation, where all other means has failed, practitioners have long been divided in opinion. Gölis has given the names of twenty-seven writers who have expressed themselves in favour of it, especially if the fluid be slowly evacuated, and at several repetitions of the operation. Yet he himself, along with seven or eight others, including Boerhaave, Heister, Hecker, and Portenschlag, proscribe it altogether as cruel and useless. Richter thinks, that even where the water is gradually drawn off, death by the disease always sooner or later ensues; and Gölis asserts that the fatal termination is even accelerated by it. It appears to us, however, that he has spoken too decidedly on this point, as there are a few cases on record where it has appeared to effect a cure, and several where it has palliated the symptoms. In cautious hands, and where only a moderate quantity of water is drawn off at a time, it has rarely been attended with any immediate danger. In cases where all other kinds of treatment have been tried without benefit, this is, perhaps, not altogether to be rejected.

In a case related by Dr. Vose of Liverpool, in the Medico-Chirurgical Transactions, this operation was performed with complete success on an infant seven months old, when the head was more than double the natural size. The instrument used the first time was a couching needle, and the quantity of fluid drawn off upwards of three ounces; about as much more was supposed to have dribbled away afterwards, upon which the child became very weak, but revived by means of the moderate administration of slight cordials. About six weeks after, the water having re-accumulated, an opening was made with a bistoury, and eight ounces were again taken away; and by a third operation nine days after the second, twelve ounces were drawn off without any injurious effect on the general health. A copious serous diarrhœa now set in, by which considerable debility was induced, but this was only temporary. The head gradually diminished in size, and the patient completely recovered.

Mr. Lizars has detailed a case in the Edinburgh Medical and Surgical Journal, in which he operated about twenty times in the course of three months. The instrument which he usually employed was a delicate trocar, which was introduced at the most lateral part of the anterior fontanelle, so as to avoid the longitudinal sinus, and thrust in to the depth of about one inch below the surface of the integuments. On the reduction of the water the strabismus and dilatation of the pupil ceased immediately. In some of the later operations, the sutures having become in part closed from the progress of ossification, the head was no longer capable of being adequately compressed, and air rushed in to supply the place of the extravasated fluid, but without any ill effects ensuing. The case proves, if not the utility of the operation, at least its safety, when carefully conducted. About the same time with the above case, another was published in the same journal by Dr. Freckleton, of Liverpool, in which the lateral ventricles were four times punctured with safety; but in the fifth operation, fourteen ounces of fluid being taken away at once, the child became very uneasy and convulsed, and died on the ninth day.

More recently the operation has been repeatedly performed, and with very favourable results, by Dr. Conquest, of London, to whose kindness we are indebted for the following particulars. The total number of children on whom he has operated is nine, and in four of these the operation has been completely successful, the individuals being now quite healthy and free from every symptom of their former complaint. The largest quantity of fluid withdrawn at any one time has been twenty ounces and a half; and the greatest number of operations on one child has been five, performed at intervals varying from two to six weeks. The largest total quantity of water removed was fifty-seven ounces by five successive operations. The trocar was introduced through the coronal suture, below the anterior fontanelle; and pressure on the head was subsequently made by strips of adhesive plaster, with which likewise the wound in the integuments was carefully closed after each operation.

The first successful case was operated on before a large number of medical men at St. Bartholomew's Hospital in the session of 1829. Of this, and a subsequent one, a short account appeared in the Lancet in April and November, 1830, to which we refer the reader for further information.

[See the results of tapping the head in nineteen cases of Hydrocephalus by Dr. Conquest, in *Lond. Med. Gaz.*, Mar. 17, p. 967, or *Amer. Med. Intelligencer*, May 1, 1838, p. 40.]

Punction has likewise been lately had recourse to with complete success by the celebrated Graefe (*Graefe* and *Walther's* Journal für Chirurgie, &c. 1831, b. xv. p. 3) of Berlin, in the case of an infant whose head, of preternatural dimensions from birth, had attained to a great magnitude at the age of four months, when the first operation was performed; no derangement in the functions of the body had, however, as yet manifested itself. The operation was repeated eleven times within the course of six months. The fluid was each time allowed to escape only slowly and interruptedly; and the canula was altogether withdrawn and the wound closed as soon as the pulse was observed to become weak, the pupil contracted, and the expression of the face altered, symptoms which, under the influence of stimulants, always disappeared within a few hours after the operation. Each operation was followed by a considerable diminution in the size of the head, and after the eleventh and last the sutures closed. The child could walk and speak before it was a year old. At the age of two and a half (upwards of a year and a half after the completion of the cure) it was exhibited at the Medical Society of Berlin.

A still more recent instance of the value of this operation has been put on record by Mr. Russell of Edinburgh. (Edinburgh Med. and Surg. Journ., July, 1832.) At three months old the head of his patient had attained to an enormous size, (twenty-three inches in circumference, and fifteen inches and a half from ear to ear.) There was strabismus and constant rolling of the eyes, irregularity of the bowels, and frequent starting in sleep; but the pupils were neither dilated nor insensible. Compression, blisters, mercury, diuretics, &c., having already been tried without the slightest benefit, recourse was had to punction as the last resource. By four operations performed at intervals of about ten days, the dimensions of the head were considerably reduced. After the fourth operation, the water again threatening to accumulate, calomel was administered in small doses, so as to affect the mouth, by which all the remaining hydrocephalic symptoms were removed, and the cure confirmed. The size of the head at eight months old was found to be less by four inches in circumference and two and a half across the vertex, than it had been previous to the first operation; and the ossification of the sutures was complete.

[Dr. Charles West (*Lond. Med. Gaz.* April 15, 1842) has inquired into the results of puncture of the head in 56 cases of chronic hydrocephalus, from which he infers that the instances in which life was prolonged by the operation appear to be very few, and the cases in which any reasonable prospect of the patient's recovery existed after a week had elapsed from the first performance of the puncture, still fewer. Sometimes the puncture was followed by an almost immediate aggravation of the encephalic symptoms, and by death. Usually, however, a degree of apparent improvement followed the puncture; but the fluid soon collected again, and the second operation was succeeded by less marked relief. The quantity of fluid increased; and whilst the size of the head continued undiminished, or even grew larger, the body became emaciated; and death took place either from exhaustion, or cerebral symptoms came on, and life was terminated by coma or convulsions.]

Storch has mentioned an instance of hydrocephalus where the spontaneous escape of about a pint of serous fluid by the nose was followed by temporary relief; and a singular case has been related by Mr. Greatwood, where a child of fifteen months old was accidentally cured of the disease by falling upon the back of the head upon a nail, above three pints of fluid gradually escaping from the puncture thus made.

When the operation of puncturing the head is followed by extreme faintness and collapse, as is occasionally the case when too much fluid is removed at once, small doses of ammonia, or a few tea-spoonsful of brandy and water, may be given to revive the patient. Inflammatory reaction sometimes sets in within the course of a day or two. Here leeches, cold applications, aperients, and other antiphlogistic measures must be employed.

Sir Gilbert Blane, conceiving that chronic hydrocephalus might sometimes depend on a want of firmness and due resistance in the bony compages of the skull, tried the effect of compression by means of a roller, with apparent benefit, in a case related in the Medical and Physical Journal, for October, 1821. But as leeches and purgatives were simultaneously employed, it is very difficult to say what share the compression had in the amendment which took place. Mr. Barnard has related two cases in the Medical Repository, in which pressure on the head made by means of straps and adhesive plaster, along with leeches and the application of cloths wet with cold water constantly to the head, appeared beneficial. [For further cases by the same gentleman see *London Lancet*, Oct. 12, 1839, p. 82.] In other hands, however, compression has failed altogether. [See a similar case cited from Caspar's *Wochenschrift*, in *Provincial Med. Journ.* April 29, 1843.]

W. B. Joy.

HYDROPERICARDIUM.—From ὕδωρ, *aqua*, and τὸ περικάρδιον, (*th.* περὶ et καρδία,) *pericardium*. *Hydrops pericardii, dropsy of the pericardium.* —This affection can very rarely require the exclusive attention of the physician, since, although the pericardium is frequently the seat of effusion, it is seldom, probably never, so affected independently of organic disease either of the heart or some other structure. The symptoms consequently are always more or less obscured by the concomitant affections; and even when we are enabled to attain a tolerable certainty of the presence of fluid within the pericardium, its removal alone would have but little effect in restoring the patient to health. These and some other considerations of a similar nature might almost induce us to exclude hydropericardium from a separate consideration, but as it has usually obtained from nosologists and writers on the diseases of the heart a distinct place, it could scarcely be omitted in a cyclopædia of medicine. The treatment of the subject is, however, a matter of very considerable difficulty, and the information we have to offer must be rather of a negative than a positive kind.

As the pericardium is a serous membrane, and hence always in some degree bedewed with moisture, a preliminary inquiry becomes necessary as to what must be considered its natural state, and what quantity of fluid ought to be regarded as constituting disease. This question has been much discussed by older authors, while the more modern have been usually content to refer to the opinion of Corvisart, without inquiring into the data upon which that opinion was founded.

Among the ancient authors, Vesalius and Lower maintained that the pericardium generally contained some fluid, and the former had observed it in the pericardium of criminals, who had been quartered while yet alive. He was not, however, certain of its existence in every case. Lower says decisively that some fluid is always present, but without any detail of the researches which led him to entertain so positive an opinion. Hoffmann, after referring to these and other authorities, merely observes that he had never been able to detect any fluid in the pericardia of animals which he had opened alive. Haller, after reviewing these and many other writers, intimates that in his opinion some fluid, but in very small quantity, is always to be found, and that it does not usually exceed a few drachms. Littre had decapitated puppies, and had always found some water in the pericardium. Senac, reviewing these contradictions, and remarking that in a number of bodies in which the heart and its envelopes were perfectly natural, the membrane was dry, inclines to the opinion that in the healthy state the pericardium contains no fluid, but at the same time admits that some fluid is occasionally observed which could not properly be referred to disease. Corvisart does not enter at any great length into the dispute, but contents himself with pronouncing, that whenever the fluid exceeds six or eight ounces in quantity, it must be regarded as the effect of disease, and consequently as forming hydropericardium. To this last author Kreysig, Bertin, Testa, and other contemporary writers are satisfied to refer, and in this state the subject still rests. Under these circumstances we have endeavoured in some degree to promote our knowledge of this subject by the result of dissections, and the following tables will show what proportion of one hundred and fifty examinations exhibited fluid in the pericardium. Fifty of these cases are drawn from our case-book; fifty, respectively, are furnished by Mr. Wickenden and Mr. Parsons of Birmingham, who are well qualified for such investigation. Any appreciable quantity of fluid was always noted, that is, whenever it exceeded a couple of drachms; in some cases even less than this was noted. To this we shall add an additional table of sixty-four cases, for which we are indebted to Mr. Baynham, whose pathological researches have been very extensive, and are most valuable from the accuracy with which they have been conducted.

I. *Table of one hundred dissections, with the number of cases in which water was found in the pericardium.*

Nature of the disease.	Total number of cases.	Number in which there was water in the pericardium.
Laryngitis	2	
Bronchitis	12	3
Typhus and synochus	7	
Phthisis pulmonalis	31	9
Scarlatina	1	
Convulsions	2	
Pneumonia	5	
Hydrocephalus	5	1
Peritonitis	4	
Enteritis	2	
Ascites	4	1
Marasmus	4	
Diarrhœa	1	
Epilepsy	3	
Hooping-cough	2	1
Disease of stomach	5	1
Internal abscess	1	
Arachnitis	4	
Disease of kidney	3	
Cholera	1	
Concussion of the brain	1	
Disease of spleen	1	
Disease of heart	12	4
Fracture of skull	1	
Phlebitis	1	1
Rheumatism	2	2
Apoplexy	4	
Hydrothorax	2	2
Tumour in the brain	1	
Diabetes	1	
Sudden death without obvious cause	4	
Disease of spine	1	
Ovarian dropsy	1	
Rupture of uterus	1	
Cancer	3	
Puerperal convulsions	1	
Puerperal mania	1	1
Menorrhagia	2	1
Pericarditis	2	
Ulceration of bowels	1	1
Measles	1	1
Pleurisy	2	
Disease of pharynx	1	
Swallowing boiling water	2	
Pulmonary apoplexy	2	
Total	150	30

The largest quantity of fluid was in the case of phlebitis, in which it amounted to sixteen ounces. In the cases of phthisis it never exceeded eight ounces, and generally not more than four: in some one ounce was the whole quantity. In the other cases it varied from eight ounces to two drachms.

II. *Table of sixty cases in which water was found in the pericardium after death.*

Disease.	No. of Cases.
Phthisis pulmonalis	14
Diseased heart	8
Pleurisy	4
Pericarditis	4
Anasarca	4
Overlaid	3
Hydrothorax	2
Bronchitis	2
Pneumonia	2
Diarrhœa	1
Diseased kidney	1
Apoplexia serosa	1
Scrofula	1
Fungus hæmatodes	1
Typhus	1
Atrophia	1
Senilitas	1
Hydrocephalus	1
Rheumatism	1
Asthma	1
Spinal disease	1
Peritonitis	1
Ascites	2
Apoplexy	1
Disease of stomach	1
Blue disease	1
Hernia	1
Sudden death	1

In both these tables it will be seen that tubercular consumption affords the largest proportion of cases in which water is found in the pericardium. Diseases of the heart stand in the next place, and, generally, affections of the chest are much more frequently accompanied with hydropericardium than those of any other cavity. The largest quantity was three pints, and was the consequence of inflammation of the membrane.

The colour of the effused fluid much varied; in most instances being nearly a clear serum, in others being of a chocolate colour. This is in unison with the experience of Kreysig.

Notwithstanding the number of these dissections, they have afforded very little information as to the diagnosis of hydropericardium; nor, if we look at the tables, can we be much surprised at this result. In no single instance did the presence of fluid constitute the only disease when it exceeded a few ounces, and in those cases in which a few drachms only were found, no symptoms existed during life by which attention was attracted to the condition of the pericardium.

Having made these preliminary remarks, we may proceed to state that no very well authenticated case of idiopathic hydropericardium has yet been related. The only instance with which we are acquainted, that is on record, is one mentioned by Morgagni upon the authority of Valsalva and even of this some doubt may be entertained The symptoms were dyspnœa increasing to orthopnœa, cough, mucous expectoration, and fever;

and the case proved fatal. The pericardium was distended with water. But as the affections of the mucous membranes were scarcely distinguished in the time of Valsalva, and as many of the symptoms above enumerated were, if not peculiar to, at least such as are usually attendant upon bronchitis, we may be pardoned if we refer the presence of water in the pericardium to the existence of bronchitis. Nor is another case, related by Morgagni, and referred to by Kreysig, Testa, and others, much more illustrative of idiopathic hydropericardium independent of other disease. This case occurred in a nun in whom the overactivity of her physician had produced hypercatharsis, and a series of anomalous symptoms for full a year, soon after which she died. The case, nevertheless, is worthy of notice in connection with this subject, although we can scarcely refer to it as a means of diagnosis.

The patient the day after the purging above alluded to became suddenly very faint upon attempting to rise from her bed, and this faintness recurred whenever she attempted to speak or move much. These symptoms continued with little variation for a considerable time; her countenance still remained healthy, and her sleep undisturbed. The bowels acted regularly, and the catamenia were as usual. Respiration in every position was uneasy. Her pulse was regular. There was no palpitation, and no pain in the chest, nor cough. The only complaint was a sense of weight in the region of the heart, and excessive nervousness. Towards the termination of her life she had sharp pains in the region of the heart; her strength gradually diminished, and at length she died. On dissection the only morbid appearances were the effusion of about nine ounces of water in the pericardium, and ulceration of this membrane. The ulceration Morgagni refers to the acrid nature of the water: modern pathologists would, probably, rather refer the whole appearances to inflammation originally, which had produced equally ulceration and effusion, both common terminations of inflammatory action.

These are the only cases with which we are acquainted, where even a pretence can exist for considering hydropericardium as idiopathic: nor does any author of late years ever regard it in this light. Nevertheless, while the science of medicine remains in its present imperfect state, every effort to forward our knowledge of the diagnosis of disease is worthy of encouragement; for if disease is to be treated successfully, excepting by accident, it must be by an accurate acquaintance with all its phenomena.

Like every other form of dropsy, hydropericardium may be the consequence of some affection of the membrane in which it is seated, or of some organic disease of other parts. In the former case it seems always to result from inflammation of the pericardium; in the latter it may be connected with inflammation, or the simple sequence of the pericardium participating in the atonic state of the general system. Kreysig has attempted to lay down the signs by which we may distinguish effusion in the pericardium succeeding inflammation of the membrane.

According to this author, when the more prominent symptoms of pericarditis subside, a feverish state with slight exacerbations still remains, and for some time a more marked symptom is present. These exacerbations gradually increase both in severity and frequency, and are soon accompanied by anxiety and great sense of oppression. The patient is unable to lie down, and usually sits with the head and chest leaning forward. The pulse becomes habitually irregular, the appetite uncertain, and the sleep bad. During the exacerbations all these symptoms are worse; the anxiety and restlessness become excessive, and delirium or most painful irritability, one or both, ensue. This state continues for some hours, and then nearly disappears, again, however, to return after a short interval of rest. The disease lasts from seven to fourteen, or even twenty-one days. During the last few days of life the patient is less complaining, and endures positions which had previously been intolerable. A species of drunken sleep is manifested; the patient lies as it were in a dream; the action of the heart becomes weak and more irregular; the extremities are cold; the surface of the body is covered with a clammy perspiration; and death at length ensues as the consequence of a weakened and obstructed circulation.

Such is the account given by Kreysig of this affection; but in it we see nothing to distinguish hydropericardium from hydrothorax. Many of the symptoms are common to this with other diseases of the heart and thoracic organs; none of them are so peculiar as to mark without error the occurrence of effusion in the pericardium. Still the whole relation is excellent; and could we see the symptoms as well developed in every case, it would certainly much facilitate our diagnosis in this difficult disease. Unfortunately, however, this is seldom the case; sometimes one, sometimes another symptom is absent, and sometimes the dropsy of the pericardium is complicated with other diseases, which leave us doubtful to which affection particular symptoms are to be referred. It is at present scarcely possible to afford any certain signs by which an accurate diagnosis may be obtained.

We might here also notice the affection which Testa has named hydropericarditis of child-bed; it is, however, as in truth is the disease above described by Kreysig, a true pericarditis terminating in effusion.

Hydropericardium from Organic Disease. — The signs by which hydropericardium may be distinguished when complicated with organic disease, especially if this disease be seated in the heart, are even, if possible, more obscure than when simply the result of pericarditis. Corvisart, who must still be regarded as the best author on this subject, has enumerated many signs by which the presence of effusion in the pericardium is indicated; yet a very cursory perusal will show us that they are deserving of little confidence. Patients, he observes, who suffer from hydropericardium have usually livid countenance, and black and livid lips; they experience great anxiety and oppression in the region of the heart; dyspnœa is so great as to threaten suffocation, especially when the patient assumes the horizontal position. In applying the hand to the heart, its action is found to be obscure and tumultuous, and the organ appears to beat through a soft body, or rather through a liquid placed between it and the walls of the thorax. Percussion produces a dull sound over a space commensurate with the extent of the effusion; and in some instances the left side over the region of the heart is more vaulted and elevated than the right. When the disease is of long duration, the strength fails, œdema of the extremities ensues, and, more rarely, a slight puffing over the anterior and left side of the chest.

Vieussens has mentioned œdema of the face and a dark leaden colour round the eye-lids, as more peculiarly indicating hydropericardium, but Testa justly regards these appearances as by no means peculiar to this affection. We have, ourselves, in a former article, remarked that all dropsies which depend upon diseases of the chest for their origin, are usually indicated by œdema of the face; and hence it must be insufficient to mark this form of dropsy alone. On the other hand, Testa remarks, and the remark is worthy of notice, that hydropericardium very rarely exists without œdema of some part of the face; and that this œdema does not disappear before death, as does the œdema of the extremities.

Morgagni, Kreysig, and Testa have discussed at considerable length the value of individual symptoms; and they have all come to the same conclusion, viz. that they are all useless to distinguish hydropericardium from hydrothorax, and often from diseases in which no effusion is present. It would take up more space than ought to be allowed to this article, were we to go over the ground which they have trodden with so much ability; nor, considering that they at last arrive only at a negative conclusion, would any advantage be derived from such a discussion. Modern ingenuity has, however, introduced a new means of diagnosis, as well as revived and improved an old one. These are percussion and stethoscopic auscultation. With regard to the value of the first, no dependence can be placed upon it in this disease. It will indeed inform us, and that with tolerable accuracy, of the extent which the heart and pericardium occupy together when there has been no condensation of the lungs nor any material alteration in the change of parts; but should either of these occur, it would be useless even so far as we have indicated. But again, should no impediment arise from the source now referred to, percussion would do no more than intimate differences of sound without informing us of the causes of such differences; whether, for instance, depending upon enlargement of the heart or effusion into the pericardium. Of this difficulty Corvisart himself was well aware.

The stethoscope may perhaps, in very practised hands, afford some information; and Dr. Hope thinks even eight ounces of fluid in the pericardium might be detected; "the sensation communicated to the hand and the stethoscope being that of an impulse transmitted through a fluid, and not of an organ striking the ribs immediately." We confess that we are not so sanguine in this respect as Dr. Hope; and we are much inclined to think, with Laennec, that less than a pint will scarcely afford any signs cognizable by auscultation.

The mistake made by Desault in tapping the pericardium may seem to corroborate our doubts. This distinguished surgeon made an opening into the chest between the sixth and seventh ribs of the left side near to the apex of the heart. He introduced his fingers into the chest, and perceived a cavity full of water, which he took for the pericardium. Dubois, Sue, and Dumangin, who were with him, examined the parts, and were of the same opinion; and Desault then enlarging the opening, let nearly a pint of fluid escape. The fluid being discharged, he again introduced his finger into the aperture, and perceived a pointed conical body to strike the finger. The man, however, died in a few days; and the conical body was discovered to be the heart enveloped in the pericardium, which closely adhered to it; and the opening had been made into a cavity formed by a membrane which united the edge of the left lung to the pericardium. Here, then, the union of the pericardium to the heart, and the proximity of the fluid, would probably have obscured even this sensation of the heart beating through a fluid.

There is only one other sign which we feel called upon to consider, and this was proposed by Corvisart; but the suggestion has not been confirmed by any other author. Even this, however, is only applicable to very large collections of water. Corvisart had observed the phenomena now referred to in two instances. To employ his own words, "the beating of the heart is perceived sometimes to the right, sometimes to the left, or, to speak more clearly, in different parts of an extensive circle. Now this could not occur if the heart should be retained, as is natural, by the pericardium, whose cavity, proportioned to the volume of the organ, fixes the extent and direction of its motions. The pericardium must, therefore, be dilated, and this may happen in two ways; by augmentation in the volume of the heart itself, in which case, though the impulse of the heart might be stronger, and occupy a larger space, still it would strike against the same place; or by an accumulation of fluid in the pericardium, and then the heart, not being likewise dilated, would swim, as it were, freely into the fluid, and strike against different parts of the chest."

There can be no doubt that this is a very important observation; but Corvisart himself had only seen two cases in which it occurred: in one there were four pints of fluid, and in the other one pint. We have ourselves in vain endeavoured to detect the phenomenon, but have never yet been able; nor can this excite surprise, when it is remembered how large a quantity of fluid is probably necessary for its exhibition.

Morbid Appearances. — These are seldom peculiar to hydropericardium; the essential circumstance of the disease being merely the presence of fluid in the pericardium. This fluid, we have already stated, varies much in colour; and the membrane itself sometimes exhibits traces of inflammation, increased vascularity, depositions of coagulable lymph, suppuration, and ulceration. A more detailed account of the morbid appearances will properly fall under those diseases of which effusion is the consequence.

Treatment. — Of this we have very little to say in addition to what has been stated under the general head of Dropsy. Hydropericardium is so rarely, perhaps never, a solitary affection, that it cannot be treated upon any exclusive principles

Only one remedy may be proposed which it seems to us necessary to mention, and this is tapping the pericardium. This operation has been very rarely performed on the living subject; nor can we suppose it probable that it will again be proposed till experiments upon animals, and observations of injuries in the human subject, tending to prove that the membrane in question may be wounded with impunity, shall have afforded more justification for such an operation than at present exists. Certainly, however, we have no reason to believe that perfect adhesion of the pericardium is inconsistent with considerable enjoyment of life, although probably not with perfect health.

JOHN DARWALL.

HYDROPHOBIA.—When it becomes our duty to illustrate the nature and history of a disease, our thoughts instinctively turn themselves to the mass of obscurity which hangs over so great a majority of morbid affections; an obscurity which, under every advancement of science, diminishes but slowly, and which keeps almost all those maladies which were unintelligible two thousand years ago unintelligible still. Sometimes it may be doubted whether the disease is truly an original mischief, or merely the symptom of some other primitive disorder; whether it is not frequently confounded with affections happening to coincide with it only in a few occasional symptoms, or is it not daily viewed in the most erroneous light with regard to its pathology and causes; or, in fine, whether proper evidence be not still wanting in these various respects, to enable physicians to establish any conclusion upon a firm and rational foundation. But whatever may have formerly been the case, it is no very common occurrence, at the present day, to have the doubts and hesitation of the writer upon what may be called a disease of extreme notoriety extended to its very existence; such, however, literally happens with *hydrophobia*, of which many intelligent persons of different ages and countries have utterly denied the existence, except as a phrenitic or maniacal affection, deriving its sole origin from the imagination of the patient, (*C. Aurel*, Lib. iii. c. xiii. p. 223.—White on Hydrophobia,) or the injudicious treatment of his attendants. It seems necessary, therefore, on the threshold, to lay before the reader the grounds of our belief in the real existence of hydrophobia, reserving for future detail any other confirmatory circumstances which may present themselves as we proceed. Having briefly stated the general arguments, we shall be at liberty to carry him along with us to the history and treatment of the malady.

Our first argument is, simply, that numerous persons become affected with the disease, which is essentially characterized by *spasmodic contractions of the pharynx, and a difficulty of drinking*, (the latter generally believed to be a consequence of that spasm,) very soon after having been bitten by an animal labouring under a similar affection; and that these persons *invariably* go on from bad to worse, and finally die before the sixth day; their bodies upon dissection presenting appearances as uniform as can be expected from the great mechanical irritation produced on the adjacent secreting and circulating organs by the violent convulsions. On the other hand, we rarely observe the same train of symptoms preceded by any other cause. Now, of these victims some are mere infants, and cannot therefore be suffering under any mental impression; others are idiotical, others delirious; in neither of which states are the sources of mental terror long kept steadily in view. But in point of fact, a very large majority of hydrophobic patients, whose cases have been distinctly described in our medical records, are positively stated to have retained an adequate clearness of intellect till long after the terrible spasm and dread of fluids had established themselves, and in very many till the last moment of existence. Not a few of them have happened to be sensible, well-educated persons, of particularly strong minds. And seeing that we have for these facts the moral evidence of the entire faculty, of all ages and countries,—to assert in defiance of it that every hydrophobic patient is the victim of his own insane fears, does really seem to us to be begging the very question or proposition which those who make this assertion are bound to prove, although in direct contradiction to all medical testimony. Besides, if the cause consisted solely in a deep impression of fear, why should the disease, its presumed effect, intermit so frequently and in so many instances, as it is known to do? It cannot be said, therefore, that the proximate succession of the disease to the bite is the effect of mental emotion; and it will be easy to show that in most cases of this special class, not one of the other presumed causes of hydrophobia spontanea, or rather nonrabida, were present. Consequently there is at least one form of hydrophobia of which the only constant known antecedent is the bite of a rabid animal; and this, therefore, in the present state of our knowledge, we are compelled to consider the cause till another is shown. Secondly, the wound inflicted is not unfrequently found to hold a manifest relation to the characteristic symptoms. At first, these do not show themselves, and the wound heals up kindly; but just before the time when the characteristic symptoms are about to appear, the cicatrix occupying the place of the wound often undergoes the remarkable alteration which we shall here for convenience technically name *recrudescence*. It swells, becomes red, livid, and painful, and the pain sometimes seems to shoot along the soft parts to a considerable distance from its origin. In other cases the wound opens of itself, and discharges a peculiar matter. Something similar is known to take place in traumatic tetanus; and although in this affection, as well as in hydrophobia, we cannot explain why the phenomenon of recrudescence does not occur in many fatal examples, yet we ought not therefore to deny that in those cases in which it does appear, the connection between the recrudescence and the disease is most remarkable. Neither is it difficult to understand that, although the bite may, yet the recrudescence may not be essentially necessary to the appearance of hydrophobia; and hence we have full warrant to infer that the wound is the antecedent principally and determinately connected with the disease as an effect. Again, it is abundantly established by observation and experiment, that the bite of a dog produces, in animals of different species, a disease to all appearance hydrophobic; and on the other hand some experiments of M. Magendie, M. Breschet, and Mr. Earle, have led to the inference that the bite, or at least the saliva of man, may produce similar effects on the lower animals. These analogies are so forcible, that notwithstanding all the original differences between the economy of the human body and that of the lower orders of creation, we cannot refuse here to admit its application as an evidence, that upon man also the bite of a rabid dog will probably produce similar effects. Lastly, the universal persuasion and testimony of the people of every country in the world for more than two thousand years, affirming the connection between the bite of mad dogs, and precisely the same characteristic phenomena of spasm in the throat and fear of drinking, is not to be passed over as a trivial or superstitious evidence of the reality of hydrophobia in man. It is not trivial, for the impression is deep; and a dread of pestilence is not more strongly implanted in the minds of men than the fear of hydrophobia; it is not superstitious, for it will be shown in what follows, that mankind came to a knowledge of this direful malady in the enlightened period between the days of Aristotle and the foundation of the great medical school of Alexandria; after Democritus and Hippocrates had long freed the science from all connection with superstition; and when the cities of Greece, Asia, Sicily, and Egypt, abounded with medical schools, and with professors alike distinguished by their cultivation of the healing art and their improvement of general philosophy. A coincidence of belief so universal cannot fairly be ascribed to accident, and is no more to be neutralized by the possible circumstance that *other causes* also may produce these symptoms, than the operation of marshy miasm in producing ague, from a well-known fact that other causes may also induce that disease, or reproduce it in the system after it has been to all appearance subdued for many years. It is still more illogical to infer, with some authors, that because the bite of a mad dog is not always followed by hydrophobia, it is therefore never succeded by it. No known cause of disease whatever, not even the exhalations of the pest-house, the inoculation of variola, or the contact of scabies, produces its effect upon *every* person to whom it is daily applied; many escape, and probably, as in the case of small-pox, after vaccination, from previous changes in the system, which have rendered the body no longer susceptible of its influence. At all events, if we were to admit the conclusion drawn by late authors, we should be obliged to deny the influence of every exciting cause of disease, of which every successive effect, from the point to which it was first applied, to the parts ultimately involved in the affection, could not be fully traced.

Having premised these considerations, we hope we may now crave the attention of the most sceptical of our readers, while we examine in detail the principal circumstances which have come to the knowledge of the profession respecting this terrible affection.

The term *hydrophobia*, from ὕδωρ, *water*, and φόβος, *fear*, has been obviously compounded to express the principal symptom of the present disease, namely "a dread of swallowing water;" the latter fluid being taken by synecdoche as the most common liquid known then, in order to signify all other drinks as well as water. On a similar principle, the most characteristic symptom, namely, the dread of swallowing liquids, or hydrophobia, seems to have been insensibly assumed as a name for the whole diversified series of phenomena which constitute the disease resulting from the bite of rabid animals. While ignorant of the proximate cause, physicians are content with naming diseases after one or more of their principal symptoms; and these denominations suffice for all the purposes of nomenclature, if they are so far prominent and uniform as readily to recal to the mind the thing signified. No medical man, we believe, ever heard the term hydrophobia, since its first reception as a word, without thinking of the disease produced by the bite of animals in the rabid state; and hence, though it may be our duty to put on record some of the more remarkable synonimes, we must say that we think very lightly of all the attempts which have been made since the days of Polybus to exchange it for one that may seem more expressive. Few rational physicians expect to find the history of a disease condensed into a sort of essence in its name; and it ought not to be forgotten that the most comprehensive appellation is not always that which produces the most rapid suggestion — the principal end, we presume, of all individual nomenclature. Nevertheless, several distinguished French authors, of late years, have seemed obstinately bent upon some innovation; and we find, for example, in the excellent *Dictionnaire des Sciences Médicales*, and the still more recent *Dictionnaire de Médecine*, two standard works, the term hydrophobia appropriated to all cases exhibiting a dread of swallowing fluids, but *not* connected with the bite of a rabid animal; to designate, in short, every form of what is in Britain named simple hydrophobia. On the other hand, to the disease resulting from the contact of rabid animals, *rabies canina, rabies*, or *rage*, is in these works exclusively applied. Both terms are employed in a sense entirely conventional; for the dread of swallowing fluids, or hydrophobia, in the literal sense, is present almost alike in the simple and rabid forms of the disease; and it seems ridiculous to apply the epithet *rabies canina* to a disease which has been produced by the bite of a wolf or a cat: and the term *rabies*, whether separate or joined with *canina*, involves the incurable fault of signifying furious delirium, a state of mind which is scarcely ever present in the disease. The ancients did not by any means fall short of the moderns in this curious research after an expressive appellation. Cœlius Aurelianus allows the investigation a due share of his excellent chapter on hydrophobia; and so many authors have since adorned the pursuit with separate dissertations, that a fanciful person might almost imagine that in the name, as in the virus of hydrophobia there lurks something contagious. The ancient Greeks seem to have had a specific term for the madness of dogs, namely, λύσσα or λύττα, and we see it so employed by Homer, Iliad ix. 239. From this they formed a verb λυσσάω or λυττάω, and the adjectives λυσσητὴρ λυσ *ώδης, rabidus, rabiosus;* terms which Homer makes his chiefs apply to Hector, while bearing all before him in the field of battle, and consequently presenting no bad image of that indiscriminate rage and effort at destruction generally displayed by the dog in a state of madness. The participle λύττων is likewise made use of by Plato in his Republic, to characterise a prince of ungovernable fury. Hence the term κυνόλυσσα, *canis rabies*, or *dog-madness*, has been repeatedly employed to designate this affection of the canine race; and it has been extended to the hydrophobia of man by Andreas and others. This, however, is still more extreme; for the translation of κυνόλυσσα is *dog-dog-madness!* an absurd pleonasm, there being no lyssa except that of dogs. The very argument urged against the term hydrophobia, that dogs drink during their whole disease, ought to have taught writers that the disease of the dog is not the same as the disease he excites in man; and consequently that neither lyssa nor synolyssa, nor any other term which properly marks the disease of the dog, can rightly be applied to that of the human species. From the patient being unable to swallow any kind of moisture, some of the Greeks named it *hygrophobia* in preference to hydrophobia. Others gave it the appellation *phobodipsia*, to express the presence of thirst generally accompanying the dread of swallowing, or the dread of liquids themselves. By Polybus it is named *pheugydros*, because those affected are observed to shun or fly from water: Aurelianus translated this by the term *aquifuga*, in which, for obvious reasons, he has been little imitated. From two ambiguous passages in Hippocrates, hydrophobics have been called brachypotæ, i. e. *parvibibuli*, and the disease brachyposia: but the word βραχὺς, *short*, may also be applied to the intervals, and thus express in brachyposia two very opposite things, either the act of drinking little, or of frequent drinking at *short* intervals. It is simply named canis rabidi morsus by Africanus and Avicenna. Mead proposed to name it δυσκαταποσία, or difficulty of swallowing drink; and Rush, full of its relations to fever, will have it called the "hydrophobic state of malignant fever." Quite recently, Dr. Good has attempted to restore the primitive Hellenic term *lyssa*, by inscribing the disease entasia lyssa.

Notwithstanding this profuse luxuriance of nomenclature, the term hydrophobia has always been and still is that by which this affection is distinguished by the rest of mankind, as well as by the best medical authors. It is the name employed by Celsus, Aurelianus, Galen, Boerhaave, Sauvages, Dessault, Linnæus, Vogel, Sagar, Cullen, and Pinel; and is still the only denomination by which the disease is known in the common language of the inhabitants of France and England, and under forms more or less translated amongst all the nations which inhabit Europe. Nor does there appear to us the least reason why it should be changed, since, as we have shown above, it accurately answers in all the circumstances necessary to a simple name, and involves no theory with regard to the exciting cause or the intimate nature of the disease, but on the contrary seems a sort of etymological reduction of its essential character to the simplest terms; hence we venture to pronounce, that in defiance of all the efforts of ingenious men to the contrary, it never will be changed. Had it contained any intrinsic misrepresentation, any inherent source of fallacy, we should not have deemed the highest antiquity a sufficient reason for discussing its merits, far less for retaining it in a work of this description. But as it cannot be accused of either, and the reader was not to be left without some knowledge of its multiplied synonimes, we have endeavoured to bring them before him in as brief a manner as perspicuity would allow.

The nosological relations of hydrophobia appear scarcely less to have perplexed medical writers than those of its nomenclature. Concerning two radical facts all seem to be agreed; namely, that there is one form of hydrophobia shortly succeeding to the bite of a rabid animal, and which is to be distinguished nosologically from all others; and secondly, that there are several slight evanescent forms of the hydrophobic spasm, which appear distinctly as mere incidental symptoms of hysteria and other common diseases; and are accompanied with little danger, and which, therefore, ought not to be classed as constituting any species or variety of the genus *hydrophobia*. But between these two extremes there occur an immense number of intermediate instances, resting upon testimony respecting which no rational doubt can be entertained; whose origin can be traced neither to injury from a rabid animal, nor to any previous disease existing in the system. For the moment, these may be divided into four different sections; first, those cases which arise almost immediately after the application of some obvious exciting cause, such as the bite of an animal not rabid, of the patient himself, a wound, or the influence of fear; secondly, those which are preceded by an obvious exciting cause, but between which and the appearance of the disease a considerable time intervenes; thirdly, those cases which appear to originate without any probable exciting cause having preceded; and fourthly, the numerous examples of hydrophobia which occur indeed after the bite of a rabid animal, but at an interval much beyond the period at which this peculiar injury is believed by the generality of physicians to be no longer capable of manifesting its powers. It is in the due allotment of these various candidates for nosological distribution that the difficulty of effecting a systematic arrangement of hydrophobia is mainly placed. It is not easy to invent a specific name which shall comprehend the whole or even the majority of them; for if, with M. Sauvages, we comprise them under the term *hydrophobia spontanea*, it is unanswerably replied, do you call the diseases of the first and second section spontaneous when their causes are obvious and acknowledged? nay, it is for you to prove that hydrophobia is ever generated spontaneously, since it is denied by the ablest authors. Again, if with Cullen, we employ the term *simplex* to signify this series of complaints, we are instantly told there is no reason to believe that these are of a more simple nature, or involve fewer symptoms than the cases proceeding directly from the bite of a hydrophobic animal; and that if we make use of the word *simplex* merely in contradistinction to the term *rabiosa*, such an application of it is entirely conventional. Nevertheless, as the terms hydrophobia rabiosa and hydrophobia simplex are very easily understood and contrasted with each other, especially since the latter term implies that the hydrophobia rabiosa is complicated (according to general belief) with the action of a poisonous virus, they are in common use in this country, and may occasionally be employed in the present article. As, however, all that seems wanted for the second species of hydrophobic affections is such an epithet as decides that the cases arranged under it do not originate from the bite of a rabid animal, (the multiplicity of causes, and our total inability to trace these causes to their obvious effects, rendering every other appellation more or less exceptionable,) we humbly conceive that some such specific terms as the following would obviate every objection.

Genus Hydrophobia.—Great restlessness and hurry of mind; horror of and difficulty of drinking fluids, accompanied by clonic spasm of the pharynx, and spasmodic constriction of the muscles of the chest.

Species 1.—Hydrophobia *Lyssodes*, succeeding, within the period of two years, to the bite of an animal supposed to be rabid.

Species 2.—Hydrophobia *Paralyssodes*, not preceded, within the period of two years, by the bite of a rabid animal, or by any other than anomalous causes.

We shall thus reconcile popular nomenclature with the admirers of Dr. Good and of the language of Homer, avoid all verbal criticism, and enable future reasoners to arrange the different modifications which the disease assumes as *varieties* under their respective species; while the symptomatic imitations of the disease may be disposed as synonymes under an anomalous species of hydrophobia *symptomatica*, as has already been done by several eminent authors. In this manner we have—

Hydrophobia *Lyssodes*.—Varieties, *canina, felina, avicularis? insectorum? fomitum? salivæ?*

Hydrophobia *Paralyssodes*.—Varieties, *traumatica, inflammatoria, phrenitica, meticulosa, nervosa, pathetica, febrilis.*

The symptomatic species are, *hysterica, febrilis, hypochondriaca, maniaca, melancholica, cynanchica, venenata.*

Let not our readers imagine that the reflection we have bestowed upon this arrangement is barren of all useful application. On the contrary, nothing is so common, on the narration of a new case, as to hear it asked,—but is it certain that the case is one of genuine hydrophobia? Were the pathognomonic symptoms present? Was it not rather one of those fatal spasmodic affections of the throat in the production of which animal virus has no share? And a person unacquainted with nosological arrangement often finds it difficult to answer such queries, as he must necessarily waver both with regard to the date at which the poison may still work its effects, and the circumstances which connect the approach of the animal with the ultimate symptoms, if he do not even hesitate much about the symptoms themselves. From the usual neglect of such an arrangement may be fairly traced that scepticism regarding hydrophobia which we so often meet with among members of the profession sufficiently sensible and unprejudiced, but whose attention has been otherwise directed. It appears unnecessary to dilate upon the criticisms which have been made by authors upon the group of symptoms which have been assumed by various nosologists, as constituting the character of the disease. Nothing was more natural than that the fears of mankind regarding the communication of this formidable affection,—fears which may be traced to the time of Aristotle,—should clothe it in all the terrors suggested by an apprehension so justly vindicated by what they observed to take place in other animals. Posterity has added very little in this respect to the horrible train of suffering already so graphically described in the pages of Aurelianus; and if some of them, since exploded by the critical science of our own day, were believed in and quoted as characteristic by the nosologists who have preceded us, these writers seem hardly to be chargeable, in fairness, with more blame than the misfortune of having lived before these errors were discovered. They are not answerable for their age; and excluding these faults, enough still remains in their definitions to enable us to recognize the disease they describe; and if there did not, it would still be very poor logic to infer that, because their definitions had failed, the disease was indefinable or did not exist. The hydrophobia of Cullen was the same as that of which we treat, although he erroneously believed it to be characterized by a desire to bite and a loathing of liquids. In the last place it were equally illogical to consider the occasional absence of some one of the characteristic symptoms a sufficient reason for withholding the general name of hydrophobia from the disease, and yet this has been a great stumbling-block with some of our most ingenious writers. Such reasoning is correct only in abstract mathematics and abstract logical discussion, where the things defined, being pure entities of imagination, can suffer no gradation without demanding a corresponding change of terms. But in nature, and more especially in organic beings, every thing is gradation and change; and no genus of plants or animals, and still less of diseases, could be subdivided into its species and varieties which do actually exist in nature, were this rule to be rigidly observed. No disease, for example, can be better defined by nosologists than pneumonia; yet how often do the physicians of the present day, by the aid of the stethoscope, proximate auscultation, and other well-known forms of minute observation, discover latent modification of it in every degree of advancement, which but a few years ago would only have come to their knowledge long after by the appearance of adhesions which they might accidentally observe on dissection. Instances might be multiplied to almost any number; but it will be more practically useful to observe that a new case of disease is to be classed by the physician rather according to its general coincidence with the symptoms of some well-known type or form, than according to the presence or absence of some individual symptom; a circumstance which, in the varied irritability of the whole system or of single organs, is often quite fortuitous: and the writer who should deny that the fatal disease suceeding to the bite of a mad cat, for example, is not hydrophobia, because it is accompanied with scarcely any dread of water, although it agrees in all other indications, may seem to reason with the metaphysical accuracy and the scrupulous definition which distinguish a geometer, but we should distrust his knowledge of the principles of physic, a science which requires great allowance to be made for incidental variations.

From the earliest antiquity of which we have any record, the dog has been the companion of man. In the book of Exodus cattle torn by wild beasts are ordered not to be eaten, but to be given to the "dogs,"—an expression which proves that these animals were already the constant attendants of man, and assisted in his pastoral labours. It was no doubt the impurity of their food that has rendered their name synonymous with every thing that is impure or vile throughout the whole of the scriptures. Still there is no allusion made to hydrophobic disease any where in the sacred volume, a circumstance which is perhaps best explained by the fact that, even down to the present day, canine madness is unknown in Syria and Egypt. We have already said that the disease was well known to Homer, and applied by him, with his usual critical exactness of similitude, to the indiscriminate havoc with which Hector sweeps through the battle-field of his enemies. Thus,—

> ————Ἕκτωρ δὲ μέγα σθένεϊ βλεμεαίνων
> Μαίνεται ἐκπάγλως, πίσυνος Διΐ, οὐδέ τι τίει
> Ἀνέρας, οὐδὲ θεούς· κρατερὴ δέ ἑ λύσσα δέδυκεν.
> Iliad ix. 237.
>
> Τοῦτον δ' οὐ δύναμαι βαλέειν κύνα λυσσητῆρα.
> Iliad viii. 299.
>
> ————ὁ λυσσώδης, φλογὶ εἴκελος, ἡγεμονεύει
> Ἕκτωρ.
> Iliad xiii. 53.

The poet with much propriety puts these words into the mouth of Ajax his enemy, for *dog* was already a term of reproach among the Greeks, (Iliad i. 225,) as well as the Jews. He no where mentions the disease as actually existing in man. In the writings of Hippocrates, there occur at least two passages, the singular language of which makes it not improbable that the physician of Cos had seen hydrophobia, and was then speaking of its symptoms, but that he did not recognise it as a separate disease, and merely considered it as a variety of phrenitis or mania, affections with which it has always been but too easily confounded:—Οἱ φρενιτικοὶ βραχυπόται, ψόφου καθαπτόμενοι, τρομώδεες. Prædict. lib. i. p. 69. Οἱ φρενιτικοὶ βραχυπόται, ψόφου καθαπτόμενοι, τρομώδεες ἢ σπασμώδεες. Prænot. sect. ii. p. 131. We transcribe the passages, but we are unwilling to strain them so far as Aurelianus and others have done; indeed, no indisputable mention of the disease occurs any where in his works, either in the genuine or the suspected. There is almost certain evidence, however, that the disease was well known to his friend and contemporary Democritus; for we are told by Cœlius Aurelianus, that, in his book upon Opisthotonos, Democritus distinctly treats both of the hydrophobic disease in man, and its origin from the bite of a rabid animal, and that he seemed to consider it as a variety of tetanus, an opinion which has been embraced by many of the moderns:—"For Democritus, who was contemporary with Hippocrates, not only makes mention of this affection, but even describes its cause when speaking of opisthotonos."[*] And in another place, speaking of the cause of hydrophobia, "Indeed Democritus, whilst treating of emprosthotonos, ascribes the seat of the disease to the nerves;"[†] by which in his time were chiefly meant the tendons, ligaments, and other white tissues. Now, we learn from several passages in Gellius, the contemporary of this well-informed author, that the works of Democritus were still extant in his time, and of frequent reference and high estimation; and it seems most improbable that Aurelianus would have referred to the chapters in which the passages were sure to be sought for, if he had wished to misquote, or to mislead the disputants in a controversy which, he informs us, was then become hackneyed, and the merits of which he appears to consider with perfect coolness. Democritus, be it remembered, was a great traveller, and may have become acquainted with the communication of hydrophobia to man in countries situated beyond that sphere of information to which the industry of the great father of medicine has ever extended. At all events his opinion made little impression on the Greeks; for we find Aristotle, nearly a century afterward, asserting that the hydrophobia may be communicated from one animal to another, but not to man. "Dogs," he affirms, "are subject to madness, cynanche, and a sort of gout or lameness. The first of these diseases renders them rabid or furious, and all the animals which they bite become equally affected with madness, with the exception of man. The malady occasions the death of the dogs affected, and of every animal that is bitten by another animal, still excepting man." (Hist. Anim. lib. viii. c. 22.) This repeated negation of the actual existence of human hydrophobia would scarcely have been made by so grave a writer as the Stagyrite, unless he had heard the contrary asserted under some degree of authority; nor could he have safely committed it to writing, unless he had previously contemplated the different circumstances. Indeed, Professor Sprengel seems to think that Euripides, who was prior even to Democritus, alludes to it in the Bacchæ, v. 337. "Acteon . . . . . mourut de l'hydrophobie. (*Euripid.* Bacch. v. 335.—Apollodor. lib. iii. c. iv. p. 189.) C'est la plus ancienne trace que nous trouvions de cette cruelle maladie." (Histoire de la Médecine, tom. i. p. 117.) Upon referring to the Bacchæ, however, we confess we cannot discover the most remote trace of an allusion to hydrophobia. In that part of the drama to which Sprengel refers, Cadmus is counselling Pentheus to join in the worship of Bacchus and Semele, to dread the danger of contemning the gods, and, as an example, to take warning by the fate of Actæon. The words are—

> ὁρᾷς τὸν Ἀκταίωνος ἄθλιον μόρον
> ὃν ὠμόσιτοι σκύλακες, ἃς ἐθρέψατο,
> διεσπάσαντο, κρεῖσσον ἐν κυνηγίαις
> Ἀρτέμιδος εἶναι κομπάσαντ', ἐν ὀργάσιν.

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[*] "Etenim *Democritus*, qui *Hippocrati* convixit, non solum hanc memoravit passionem, sed etiam cujus causam tradidit, cum de *opisthotonicis* scriberet." Lib. iii. 15.

[†] "Equidem *Democritus*, cum de *Emprosthotonicis* diceret, nervos inquit." Ibid.

Which may be thus simply translated into English:

Thou seest the wretched fate of vain Actæon,
All torn and scattered by the raw fed hounds
He cherished; meanwhile boasting in the chase
To excel the great Diana, forest queen.

Still the testimony of Apollodorus would be curious, if it evinced that human hydrophobia was known and believed in shortly after the time of Aristotle, and long before the age of Asclepiades; a fact which is strongly corroborated by what we have already stated from Aurelian, of the opinions respecting hydrophobia maintained by Andreas, who flourished two hundred and four years before Christ. Apollodorus, whose words follow, lived in Egypt, under Ptolemy Physcon, about one hundred and thirty-three years before Christ, more than half a century before the period at which Asclepiades flourished. His work is a history of the Gods, wherein, describing the death of Actæon, he says, ——— *οἱ πλείονες λέγουσιν ὅτι τὴν Ἄρτεμιν γουομένην εἶδε. καὶ φασὶ τὴν θεὸν παραχρῆμα αὐτοῦ τὴν μορφὴν εἰς ἔλαφον ἀλλάξαι. καὶ τοῖς ἑπομένοις αὐτῷ πεντήκοντα κυσὶν ἐμβαλεῖν λύσσαν, ὑφ' ὧν κατὰ ἄγνοιαν ἐβρώθη.* Artemidorus, as we learn from the Symposiaca of Plutarch, must therefore have been mistaken, in asserting that Asclepiades the Bithynian was the first who introduced this disease to public notice. This Artemidorus, who lived down to about the time of Adrian, must not be confounded with the follower of Erasistratus, of the same name, who was a native of Sida, and who flourished, according to Sprengel, two hundred and twenty-three years before Christ, and is celebrated by Aurelianus for his doctrine respecting the seat of hydrophobia, which he placed in the stomach. In this he was partly opposed by Gaius, a follower of Herophilus, and who wrote a treatise on hydrophobia, or the "dread of water," about the same time; and who seems to have been inclined to place the seat of the disease in the nervous system, and more especially in the pneumo-gastric portion of the par vagum.* The nerves were divided by Erasistratus into nerves of sense and nerves of motion; the nerves of sense originated from the brain itself, the nerves of motion from its membranes; and in the latter number no doubt was reckoned the eighth pair, as we see it in this passage. Asclepiades, or at least the greater number of his followers, referred the chief seat of hydrophobia to the membrane of the brain; the irritation of which, according to him, was the principal cause of all mental diseases, as phrenitis, lethargy, epilepsy. (*Aurelianus.*) Others of them maintained that it chiefly occupied the diaphragm, as that membrane was much affected with pain during the disease. But Artorius, the most distinguished of his followers, who afterwards became the physician and familiar friend of Augustus, but perished at sea shortly after the battle of Actium, reverted to the doctrine of Artemidorus, and assigned to the stomach the honour of being the original seat of the disease.

We have thus been enabled, by the aid of modern research, to demonstrate to the reader, 1. that the hydrophobia of dogs has been known from the earliest ages; 2. that there is every reason to believe that human hydrophobia was considered as an established disease by Democritus and Polybus, and had been heard of by Aristotle; 3. that its nature and treatment were discussed in the school of Erasistratus by his immediate followers; 4. and lastly, that Asclepiades does not seem to have added any important observation to what was already known on the subject, though his followers rather than himself propounded some unsatisfactory conjectures as to the seat of hydrophobia. Nevertheless, the distinct account of the nature and treatment of this disease delivered by Celsus, who was an auditor of Themison, the successor of Asclepiades, at Rome, evinces rapid progress towards an accurate knowledge of this formidable affection, from the no very distant period at which it most probably became generally known to the world through the medium of the school of Alexandria. Instead of quoting a work so common, we shall merely extract the substance of what was known to this admirable eclectic. The disease named hydrophobia usually arises from the bite of a rabid dog, the wound of which has not been properly treated by preventive measures. The suffering is terrible, the patient being tormented at the same time with the dread and the desire of water; and under this he gradually sinks with very little chance of recovery. The only known remedy is to throw him unaware into a pond before he sees the water, where, if he cannot swim, he will swallow a sufficiency of water while he sinks and rises by his own efforts; but if he swims, the same end is to be attained by the assistants dipping him under water from time to time. In this way the thirst and dread of water are both made to disappear. There is some danger, however, lest the enfeebled patient should be carried off by cramps or convulsions from the effects of the cold water; to avoid which he is immediately to be put into warm oil. Free doses of opiates combined with aromatics and antispasmodics may be given either as antidotes or remedies; but if the disease has already supervened, they may be given in pills in preference to the fluid form. When the dog which inflicts the bite is known to be mad, the virus is to be extracted by the cupping-glass. The wound is then to be cauterized, unless it happen to be in muscular or nervous parts: if the cautery cannot be permitted, bloodletting will be useful. The sore after the cautery may be dressed with the usual irritants; but if the cautery has not been employed, the wound must be treated with more active escharotics, and finally healed up. Immediately after the accident, some send the patient to the bath, where he is made to sweat freely, and lay open the wound by scarification in order that the poison may escape in greater quantity, and follow up the practice with a liberal allowance of the strongest wine, which is an antidote to all poisons.

Such was the state of knowledge with respect to this disease in the Augustan age, and Sprengel thinks it owed a considerable share of its precision to the singular circumstance of Themison, the distinguished professional teacher of Celsus, and of nearly all the medical men then living, having himself become affected with simple hydrophobia, and narrowly escaped; an event which we may be sure would be copiously alluded to in his lectures, although Aurelianus gravely asserts that he was always threatened with a fresh attack the moment he began to describe the disease. "Ferunt," says Dioscorides, "Themisonem medicum amico aquam timenti (ὑδροφοβιῶντι) prompte et humane inservientem, in eandem incidisse affectionem, nec nisi post multos labores servatum." (Lib. vi. de canis morsu, p. 733.)

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* "Gaius, Herophili sectator, libro quo de timore aquæ scripsit, ait cerebrum et ejus membranam pati. Etenim voluntario motu servientes nervi atque stomachum colligantes, initium vel originem inde sumpsisse noscuntur."—Aur. ib.

It seems almost certain that Dioscorides was contemporary with Themison, and he would not have omitted the practice of bloodletting in hydrophobia recommended by Celsus and Eudemus, had it been known to him; nor yet the ingenious expedient of endeavouring to sweat out the poison by means of the hot-bath, or the formidable auxiliary of repeated submersion in cold water. Let us give Dioscorides, however, with the vulgar, to the reign of Nero, and we shall see that terror had already begun to magnify the natural horrors of hydrophobia. "Some patients," he affirms, "bark like dogs, fly upon and bite all near them, and like the former animals communicate the disease to those unfortunate members of their own species whom they have torn." Like Celsus, he makes distinct mention of the poisonous virus presumed to be injected by the teeth of the dog, and orders it to be sucked out by the mouth or by the cupping-glass, which is to be strongly exhausted for this purpose. His precepts for scarification are precise as well as judicious; he insists on the excision of the bitten part, and in certain cases recommends amputation. In these severe precautions he speaks from his own experience, by which he has preserved many persons that were bitten, from the supervention of hydrophobia, which disease, when once established, he deems quite incurable. He is the first writer now extant who declares that he had himself seen and treated the disease. The absurdities concerning hydrophobia collected by the elder Pliny only merit allusion in so far as they evince that the terror and exaggeration it produced were much greater among the vulgar than among physicians; but the perusal of the able treatise on hydrophobia which occurs in Cœlius Aurelianus affords sufficient proof that with the latter also the alarm was progressive. He, or the author he has been supposed to translate, lived about the same time with Galen, in an age still very learned, about the year of Christ 200–230. Not only do his hydrophobic patients bark like dogs, and communicate the disease by biting to man, but "their voice has a barking tone, and they roll their bodies up from head to heel, in the spiral manner assumed by the dog in laying himself to rest: they walk with the level, slow movement of persons carrying water in a full vessel; the tongue projects from the mouth; the bile that is vomited is most frequently black." A moribund patient ran upon a mad dog whom chance presented, and bit him furiously, then rolled himself up like a ball and expired. To inhale the air contaminated by the breath of the rabid dog was sufficient to produce the disease, &c. Still we are not to measure the importance of Aurelianus by the scale of his errors, or, to speak more truly, by the errors of his age; his description of the phenomena of the disease is for the most part surprisingly faithful; indeed, so exquisitely graphic, that to copy it here would be to anticipate much we have to say in the succeeding history of the symptoms. His notions of the prognosis and diagnosis are generally just and sagacious; and though his method of cure derives a very distinct character from the theories of his own sect, (the methodists,) yet he has added with an impartial hand the treatment recommended by others. Lastly, he has given a very instructive view of the different controversies respecting hydrophobia which prevailed in his time, and compared them with each other with an intelligent fidelity which, in spite of his barbarous Latin, is always highly interesting. No student of hydrophobia should omit to read this part of his work. Galen, his contemporary, and in some measure his predecessor, was a great collector of what had been done before him, and his opinions swayed the schools for 1300 years after his death. It may be sufficient, then, to say that the sentiments of Galen with regard to hydrophobia were those of all mankind at the revival of letters. He appears to have turned his powerful mind to this subject with particular attention. He invented several antidotes against hydrophobia; one of which, the ashes of the river crab, he assures us he had never known to fail. He compares the operation of the canine virus to the action of slow poisons, which, though given daily, only produce a visible effect after a certain time. The virus is like wood *placed near the fire*, which becomes gradually hotter and hotter, and at length bursts into flame and is consumed. The virus is by no means idle in the wound, although it does not betray itself by the least symptom for many months, in one case known to himself, for a whole year. Canine virus thus proceeding step by step slowly generates a disease, which sinks deeply into the solids, and is therefore so much the more tractable, just as we see taking place in the leucæ and other obstinate forms of leprosy. The dread of water he conceives to arise from mental aberration, which he calls *impaired judgment*. In addition to his antidotes, he orders the excision of the part bitten to be made of a circular form, in order that every part tainted may be removed, and the disk thus laid open is to be kept raw by escharotics for forty days. Alyssum calycinum, or madwort, is recommended for a cure; as also the liver of the mad dog which had bitten the patient. He gives a tolerably fair account of the signs of rabies in dogs, at least in the more violent cases. He attributes the original occurrence of hydrophobia among dogs to the spontaneous corruption of their fluids; and as his theory of the origin of diseases, now better known by the name of the humoral pathology, referred almost all complaints to a similar degeneration of the humours, he finds occasion to recur frequently with triumph to this instance of the canine virus. On one occasion he gravely draws a parallel between the self-generated poison that produces hydrophobia, and the self-generated poison that, as he imagines, produces phrenitis. The reader will at once observe that the notion of spontaneous hydrophobia, so long maintained, and not yet entirely relinquished by some authors, as by M. Rochoux, is a legitimate portion of one of the most exploded doctrines of Galen, and is supported by no better evidence at present than it was in the time of its ingenious author. With the exception of some oriental flourishes, such as the presence of little dogs in the urine of hydrophobic patients, we find the Arabians copy the Greeks with great closeness. But as some of them, Avicenna for example, are more systematic and more copious than the Greeks themselves, they may still be read with advantage. Thus the last-named author notices both the peculiar apoplectic termination of hydrophobia, and the changes occasionally affecting the urinary organs; facts which scarcely occur in the Greek or Roman writers. Africanus, a learned follower of both in the darkest age of our era, has added nothing new.

We have thus come to modern times, and in these we have not been able to resolve the question at what time arose the custom of smothering hydrophobic patients by means of beds or pillows. Of this horrid practice no trace is to be discovered before the sixteenth century; and next to the burning of witches, it affords the most pregnant example of fear, purely imaginary, becoming the cause of the most detestable public crimes. The apprehension of danger from the breath, saliva, or bite of the unfortunate sufferer, combined, it would seem, with an obscure notion of the disease being attended with something like demoniacal possession, were the original apologies for resorting to this cruel security, the consummation of which the morbidly timid patient dreaded from the approach of every person that entered his apartment or advanced to his bed. Hence the fury, the repugnance, and frequent attempts to injure the by-standers, so prominent in the histories of hydrophobia recorded during the two last centuries, and so rare in the present. Professional scepticism and critical inquiry, by showing that these fears were entirely without foundation, have alone relieved humanity from the reproach of these delusions, and the sufferers from the unspeakable horror of being murdered on their death-beds, often by the hands of those whom of all others they most loved; for the frequent opportunities of inspection after death, afforded by the now zealously cultivated science of anatomy, has never cast any additional light on the subject.

In presenting a view of the symptoms of rabid hydrophobia, we are enabled to derive less benefit from arranging the phenomena according to the order of time than in most other diseases. The latent period is so irregular in point of duration, and affords so few marks of the presence of disease in the system, that some able physicians have felt inclined altogether to dispute its connection with hydrophobia. The stage of recrudescence, however, observes a tolerably uniform relation towards the succeeding disease, since it generally occurs a few days before the latter is constituted: but then it is often wanting, and even when present, seems sometimes a precursor, sometimes a symptom of the third stage. Nay, the pharyngeal spasm and dread of fluids, the nervous agitation and gastro-pneumonic symptoms, have all been described as occurring in almost every possible order of succession in different individuals. The true key to this endless diversity is found in the fact, that by far the greater number of the symptoms which fall to be recorded are of a secondary character, in consequence of which the time and intensity with which they appear are greatly regulated by the intensity and time at which the cardinal symptom they follow has showed itself. These cardinal symptoms are five in number: first, a depressed, excited, or altered state of the nervous system of the individual; second, a depressed, excited, or altered state of the mind; third, fever; fourth, difficulty of swallowing fluids; fifth, gastro-pneumonic symptoms. From one or other of these every remaining symptom is believed to flow. But as observation teaches us that any one of these may be the first to show itself, and any other of them may follow it in succession, it is easy to discover, without resorting to the law of permutation, that the varieties in this respect presented by the cases actually recorded must be very numerous, though all coinciding in one common circumstance —that whatever may happen to be the order in which these cardinal symptoms supervene, they never extinguish each other, or again disappear. Still, as it is the nature of the human mind to pass forwards from cause to effect, and consequently according to the progress of time, we shall adhere to established practice in this respect, and tracing the symptoms in that order in which they most generally occur, rest satisfied with having endeavoured to select the course which presented fewest faults. We divide this disease, therefore, into three periods, namely, the stage of *delitescence*, the stage of *recrudescence*, and the stage of *spasm*.

First stage, or delitescence.—In the first stage there are generally few symptoms to be observed, except such as are usually found to occur from the bite of the most healthy animals. The wound, whether dressed, or, as often happens, neglected, heals up kindly, leaving a cicatrix, which differs in no respect from that which supervenes to a similar wound inflicted by the teeth of an animal in the best health. It may be remarked that in many cases the injuries inflicted by hydrophobic animals do not involve any extensive laceration, a circumstance which may be attributed to the sickness of the animal, and the unsteadiness of purpose during this malady. The younger Cuvier has observed that the great characteristic of the animal mind, as compared to that of man, appears to be the facility with which it passes into the state of rage or fury, and remains governed by its influence; but in the hydrophobic dog this instinct seems often to be modified into a snappish irritability, by which the creature is easily induced to bite, but does not inflict the wound with much energy, nor attempt to repeat it. Huntsmen, we are told by Rush, accordingly divide the rabies of dogs into the *sullen* and the *furious* hydrophobia, in which latter form the lacerations inflicted by the dog are deep, large, and frequently repeated. In another place we shall endeavour to show the effect of education and of the original disposition of the animal in determining the frequency of tne sullen and the furious forms of the disease; but for an example of extreme injury of this kind the reader is referred to Dr. Hamilton's Appendix, page 325. The man had a large wound on the throat, which laid the trachea quite bare to a considerable extent, and which likewise appeared to be considerably bruised; one on the cheek, which enlarged the mouth a full inch; a smaller one, lower on the chin, and another, lower than the former one, on the throat, which evidently proved that the animal had changed his hold.

In most cases, however, pain has been felt in the cicatrix a considerable time after the accident; but such a feeling is so frequent in the seat of wounds recently healed, that its occasional presence after the bite of mad animals ought not perhaps to be considered as any thing singular or characteristic. In several examples upon record (Edin. Med. Surg. Journ. vol. iii. p. 414,) slight fever came on very soon after the accident, and continued till the appearance of the hydrophobia, which in such instances supervened in the course of a few days. But as in general the period of delitescence in genuine hydrophobia is seldom shorter than forty days, or longer than twenty-four months, such cases have by many writers been considered to originate purely from the fever or the mechanical irritation, and consequently referred to the non-rabid species. We may take an opportunity to remark that we have here, as well as in our definition, assumed two years as the longest period of delitescence, because it seems to be the opinion maintained by the most rational medical writers upon this subject, from Discorides downwards; and because Drs. J. Hunter, R. Hamilton, and S. Bardsley, have shown that all the credible cases on record occurred before the eighteenth month; likewise because we have heard of no instance of recrudescence taking place in the wound after this period; and, finally, because so just is the instinctive impression left by experience, that every medical man would hesitate were he to hear in the course of his practice of an individual case of hydrophobia referred to a cause much anterior to this limit. This, however, we may do, without pretending to assert that it is impossible for the cause of hydrophobia to lurk longer in the system than two years; but we say that the connection between the bite and the spasm has not been satisfactorily traced upwards beyond this point, and that if we were to take a thousand persons who had survived the bite of a mad dog during two years, we should not at any time afterwards find one of these persons become affected with hydrophobia without the infliction of a new bite.

In the period which intervenes between the healing of the wound and the second stage, little satisfactory has been observed; a few individuals have become retired, gloomy, and melancholy, the countenance expressing considerable anxiety; but as the pulse, skin, and other indexes of the functions continue natural, it seems impossible to affirm that these signs of depression are not the sole offspring of mental anxiety regarding the hazard in which they in general know but too well their life is placed by the accident. The other symptoms attributed to this stage by authors seem purely accidental.

Second Stage, or Recrudescence.—The commencement of this period is deservedly one of great alarm to the patient, and accordingly it is one about which the medical man is for the most part consulted early, and the progress of which, therefore, he is furnished with a fair opportunity of observing. It may be added that, when it occurs, the patient and the practitioner have each a longer warning, and for that reason a more promising chance of obtaining a cure of the hydrophobia which generally follows; although some have said that the recrudescence itself is an indication merely of the greater activity of the virus and the more exasperated form under which the malady is about to appear. At first a pain is perceived in the cicatrix, at times attended with itching, but in general resembling the aching of rheumatism, which in some cases shoots to some distance along the limb affected, and in others degenerates into a species of torpor in the part itself. In one case under our own care the sensation of the thumb bitten was that of torpor, and such extreme rigidity that its joint could not be bent: meanwhile the sensation of pain was in the neck and shoulder. The thumb was without redness or swelling. Sometimes the cicatrix is merely affected with a sense of coldness, with stiffness, extending along the limb; and in one case the arm thus affected became paralysed. In a few cases the pain does not begin precisely in the wound, but in some part near the trunk, as the shoulder or hip. The scar becomes red, swollen, sometimes livid, and in one case was surrounded by a papulary eruption, (Edin. Med. Surg. Journ. 1807;) and in the course of a short time it opens and discharges a peculiar ichor. Meanwhile flying convulsive pains are felt in various parts of the body. As the disease proceeds, the patient, according to Dr. Marcet, complains of pains shooting from the wound to the region of the heart, and in general both he and Babington, with Professor Callisen, have observed in different cases that these recrudescent pains seem always to follow the course of the nerves, and do certainly never inflame or irritate the lymphatic vessels and glands in the vicinity, though passing in a parallel course towards the trunk. Thus a bite on the upper extremity produced pain of the arm and shoulder, but did not affect the axillary glands; and from a similar wound of the leg, the pain was conveyed to the hip and loins, but no irritation of the saphenic systems of lymphatics, or of the glands of the ham and groin, were observed to take place. We may add to the above, the entire absence of any fact contrary to this observation in the works of the numerous authors who have written on the subject. In some cases the wound does not open, but a sense of torpor, pain, and occasionally of roughness in the integuments, shoots along the limb which has been wounded. In an instructive case of this kind related by Mr. Oldknow, of Nottingham, in the fifth volume of the Edinburgh Journal, though the patient was wounded in three distinct places by the same dog, namely, the scrotum, the thigh, and the left hand, yet the uneasy sensations were perceived in the arm alone, *though last bitten*; as if the hydrophobic, like tetanic action, were most easily excited by irritation of the extremities. These recrudescent symptoms took place forty-two days after the bite, and four days before the hydrophobia became confirmed. It is seldom that they occur longer than six days before the disease becomes marked, and the most general term of their appearance seems to be two or three days before hydrophobia supervenes. In one case which we attended, and which we have also described, the patient died on the seventh day after the pain commenced in the part bitten, and fifty-six hours after the hydrophobia had distinctly commenced. The recrudescent symptoms, therefore, occupied more than four days. With regard to this point, however, and to the relative frequency with which the symptoms of the second stage are present or absent, no very precise information can be obtained. They are rarely mentioned in the more ancient cases, and occur so frequently in those of modern date, that the difference can only be attributed to the older writers having considered the state of the cicatrix with little attention. By Aurelius, however, and consequently by the authors whose collective views he represents, this symptom was beheld in a most important light; "Præpatitur enim ea pars, quæ morsu fuerit vexata; unde initium denique passionem (sc. hydrophobicam) sumere, nemo negat." This, however, is not the only medical observation that seems for a time to have suffered a certain degree of oblivion. In point of fact, it has been proved by Dr. Hamilton that by far the greater number of hydrophobic cases commence between the thirtieth and fifty-ninth day after the bite, and consequently at a time when the wound produced at first by the animal, and afterwards enlarged by the surgeon, is in many cases scarcely healed up, and almost always retains that high degree of sensibility proper to recent wounds, and which generally gives rise to considerable pain upon any great change taking place in the system; often, indeed, from mere vicissitudes of the weather. In several instances the pain has been perceived immediately after a debauch, and in one remarkable example it darted into the part the moment the patient was told that another person bitten by the same dog had died of hydrophobia. Though there can be no doubt, therefore, of the actual occurrence of this recrudescence in examples taking place long after all the superinduced sensibility of the part had disappeared, or where re-opening, discharge, or eruption had taken place around it; yet it is not easy to come to a conclusion in cases where the circumstances have been different. A late distinguished nosologist, Dr. Good, has received this phenomenon of recrudescence, which without doubt is very general, into his definition of hydrophobia; and we have judged it necessary therefore to explain, as far as was attainable, the modification to which this character is frequently subjected.

Third Stage, or Hydrophobic Phenomena.—This assemblage of symptoms, from its fatal event, the pity, consternation, and horror excited in beholders, and its obvious diversity from all other maladies afflicting the human race, whilst the latent and recrudescent periods which succeed the application of the exciting cause differ little from any other morbid states of the system, has very generally been considered as constituting the whole generic disease of hydrophobia. In strict accuracy, however, this whole group is to be considered merely as a symptom which may be resolved into separate parts, but yet simply indicates a single stage, such as is well known to occur symptomatic of many states of disease or irritation in the system; nor is there any better reason that the patient's health is entire and the disease quiescent, during the first two periods, than in that period of calm composure, facility of drinking and swallowing, absence of pain and mental suffering, which appear so generally for some time before the sudden death of the patient, and which sometimes, as in Dr. Johnston's case, interposes itself in the midst of the disease under the form of remission. We are in no hurry to anticipate the different views that have been taken of the mode or train of action by which the bite of a rabid animal produces this horrible disease; being different, they cannot all be true, and could therefore render us little service here. But, however unknown, they exert an operation on the day in which they render the disease cognizable to the senses, which they could not put forth before, and have therefore been undergoing a series of changes themselves, or operating a series of changes in the constitution from which has resulted this increase of power. From the moment of the bite, then, a morbid action is in progress and accumulation, and he who would deny this may equally deny that the death of the patient, in many instances so visibly disjoined from the paroxysmal state, is owing to the same cause; he must deny, also, that it produces the return of this state after the remission. Yet this series of paroxysmal symptoms is that to which the attention of the practitioner is chiefly directed, and he is, therefore, very easily led to consider it as the essential part of the disease. For some days previous to that on which the disease presents itself, the countenance of the patient indicates anxiety, and he is himself conscious of a restless, rather depressed state of mind. The eyebrows are contracted, the face tumid, and there is headach with tremors. In a certain number of cases a sense of general chilliness, like that preceding fever, is perceived, before any more marked symptoms appear. He is sometimes drowsy through the day, and in other instances has his sleep broken and disturbed in the night. The disagreeable feelings originating from the cicatrix go on to increase; occasional sighing, unaccountable flushes and rigors of momentary duration, and in a few cases slight febrile symptoms succeed. A sudden loathing of food has been repeatedly observed at this period, the patient being sometimes surprised at finding his usual appetite converted into aversion on sitting down to table; and in other instances he becomes suddenly affected with nausea or vomiting. In some persons the peculiar pain, usually referred to the scrobiculus cordis and diaphragm, has been first perceived at this instant, and in one or two cases appeared to originate in the violent efforts made to vomit; but the symptom generally comes on considerably later. A sense of stiffness, gradually becoming painful, is now felt in the back part of the neck, and extending forwards along the basis of the jaw towards the root of the tongue and the pomum Adami of the larynx. Sighing is more frequent; the respiration is easily hurried; and there is often some headach complained of at this period. If the patient attempt to swallow any thing, he finds himself unable to perform that office; the matters introduced are rejected with violence from the mouth, and the muscles of the mouth and pharynx are seen by the bystanders to be thrown into violent convulsions, in which not unfrequently the muscles of the face participate. This is the pharyngeal or hydrophobic spasm, which, by creating a dread of swallowing fluids, has given name to the disease; for although patients are generally able to swallow food and other solid substances with tolerable facility, yet any attempt at drinking, be the fluid what it may, is almost sure to be followed by the spasm and sense of suffocation. Though in most cases the painful spasm is the only cause of the dread of swallowing fluids, and eventually of the fluids swallowed; yet this fear may, in its turn, become the cause of the spasm, the patient, by endeavouring to avoid its recurrence, often originating the very motions which produced it.

The same error of function is frequently observed to take place in these parts in persons who find a natural difficulty in swallowing pills, in painful cynanche, and in eating and drinking while the mind is much engaged upon something else. The parts are scarcely quite voluntary, as is proved by its being impossible to make them perform their office when they are altogether dry; and accordingly our knowledge of the position of objects within them derived from their mere sensation is always obscure, and the efforts made in consequence sometimes prove misdirected or fallacious. In drinking it is not necessary that greater efforts should be made than in eating; but from the facility with which fluids glide along, they often present a larger mass, which requires a greater effort to be propelled at once into the pharynx by the organs of deglutition; and as they easily slide into the smallest cranny, they render the closest approximation of the two lips of the glottis, and of the epiglottis upon these again, indispensably necessary; and as the movement of drinking is generally of the continuous kind, the oppression of the respiratory processes is always considerable, even in health, as is demonstrated by the strong inspirations rendered necessary after a large draught. They must eventually, however, be much greater in hydrophobia, where difficult respiration and irritability of the larynx and fauces are already at their maximum. Besides, in the movement of swallowing, the larynx is drawn upwards and forwards, and the root of the tongue thrown backwards over the larynx, a circumstance which must greatly increase the tendency to suffocation resulting as described; hence the very great augmentation of this spasm while the larynx is being drawn up. As the disease proceeds, this symptom becomes more severe, and calls in a more extensive train of concomitant evils; of which number are laborious respiration, sighing, vomiting, flutulent eructations, a sense of a ball or pressure on the throat, urgent thirst, a burning pain along the course of the spine, neck, and vertebral column. The increase of saliva at this period seems to arise partly from the vehement irritation of the salivary glands which is produced by these movements, as a similar state occurs in many healthy persons, when induced from anger or loquacity to move the muscular parts in the basis of the jaw with great activity. In other cases, however, the saliva is said to precede the spasm, particularly in animals; and in al. such instances it must be referred to the specific effect of the poison upon the salivary organs, a series of glands which, of all others in the body, most readily yield their secretion to a new stimulus. The best authors are agreed that it is the experience of the painful sensations thus produced which in general gives rise to this fear of drinking, which is afterwards, by a too natural process of association, extended to liquids themselves, and finally to polished bodies, to light, to cold, to fresh air, to names or sounds, or indeed to any thing that serves to suggest to the mind of the patient the horrible idea of his sufferings while attempting to swallow fluids. In this opinion we feel ourselves obliged to coincide, as well from the result of our own experience as from the consideration of a number of recently well-attested cases, in which the patients not only denied every antecedent dread of fluids, but made many spirited and occasionally successful efforts to overcome that spasmodic resistance which alone prevented their transmission to the stomach. If we add to this the fact of the dread of water disappearing during the intermissions which have occurred in some cases, and in that final remission which occasionally takes place before death, we shall see that the spasm is the chief cause of the dread of water; and that if the latter had depended, as some think, upon a peculiar modification of the mind produced by the bite, it would not be so frequently absent. The disease is now fairly constituted; the patient is tormented with thirst, every attempt to allay which by drinking only serves to bring a new and more severe paroxysm, the convulsions of which often extend themselves to every muscle of the body, whether of head, trunk, or extremities. There are vomiting of a greenish or dark-coloured matter, eructations, inflation of the stomach and bowels, great pain in the region of the diaphragm, restlessness, heat of skin, and sometimes considerable frequency of pulse. The latter has counted as high as one hundred and fifty beats in a minute. In addition to the headach and singular cast of countenance already mentioned, a peculiar brightness, 'a wild and sparkling expression' of the eye, compared by authors to that observed in incipient ebriety, and a retraction of the angles of the mouth approaching to the sardonic grin, and referred to the well known sympathy subsisting between the diaphragm and zygomatic muscles, are symptoms confined to the head and face. The latter is sometimes suffused, sometimes pale, or varied with large, irregular, ruddy spots. A great plurality of testimonies has satisfactorily established that a certain change or alienation of mind takes place during this disease; but in what the alienation consists, how it is to be described, or where it has its origin, are questions which have all been violently disputed. The most general form under which it appears is a certain promptitude of action and loquacity while engaged in conversation, which is chiefly evinced by the patient rendering longer answers and more circumstantial explanations than he might naturally be expected to do at another time; yet his ideas are said to be perfectly coherent, his reasoning just and consecutive. But the susceptibility of the mind, also, as well as of the body, becomes generally increased, and in this point the analogy with incipient ebriety fails, with the exception perhaps of a very few instances. This morbid susceptibility is manifested by a tendency to take alarm at inadequate causes, and to form suspicions without any probable grounds; and, in fact, the dread of water itself, and of every thing suggesting the *idea of water*, may in certain subjects be merely another of its indications. High delirium is seldom present except during the extreme violence of a paroxysm, and then but rarely; and as to the states of mental alienation, vulgarly designated by the terms mania and melancholia, they can scarcely ever be said to be present in this disease, however universally the former opinion may once have been diffused. It is fair, however, to remark that the reasoning faculties cannot be altogether entire in a patient who indulges undue suspicion, and who, contrary to previous habit, launches into verbose harangues upon every trifling occasion; for it seems to be the very essence of sanity to perceive justly the relation of its possessor to present external circumstances, which relation is by such persons evidently neglected. We dare not, however, go to the length of proposing for this peculiar susceptibility of mind the term of *lyssomania*, so many patients having expired of this disease without having exhibited the least symptom of suspicion or loquacity. There is still ground for apprehending that their fears are in some instances owing to the vulgar apprehensions of the rough treatment under which the last scene of hydrophobia was till very lately generally believed to terminate. Thus, taking one of many instances, the patient Groves, whose case is related by Dr. H. Maclean of Sudbury, in 1792, had imbibed the idea that "he was to be smothered between beds, and in the most earnest manner entreated us not to shorten his sufferings in this manner." Indeed, only twenty years before, an attempt had been made by the attendants in the Leicester Infirmary to destroy a hydrophobic boy, Nourse, in a similar manner, and they were only prevented from effecting their horrid purpose by the timely intervention of Dr. Vaughan. Groves was a powerful man, in the prime of life; and when we consider the characteristic timidity of hydrophobic patients, we may well conceive that a very great number must have suffered under this apprehension, without daring to give it utterance. So late as 1814, Dr. Albers of Bremen was sent for by a hydrophobic patient in order to bleed her to death, and thereby release her from her sufferings; and she seems to have considered this as quite within the line of the doctor's ordinary practice. The loquacity, though in most instances the result of the peculiar nervous excitement present, may in others arise from the new and terrific circumstances under which the patient is placed, something like what is often observed in persons led forth to execution; and it is no doubt greatly promoted by the accelerated circulation and intensity of sensation which accompany the hydrophobic spasm. Both are symptoms, however, very generally present, and it is under that view they are brought into notice here.

The whole of the symptoms above expressed may establish themselves in a few hours after their commencement, though in general they can scarcely be said to become so fully developed before the second day; and death most usually happens on this and the third, according to Hamilton's table, although in a considerable number it has taken place after twenty, twenty-four, or thirty-six hours; and in others it does not happen before the fifth day, and in some few instances does not before the eighth or ninth day. Hence there is seldom much time afforded for contemplation of the more exasperated form into which they subsequently pass, but yet they have been observed and described by medical writers with great exactness, and have gradually become separated from the fictions with which they were combined by ancient authors. The sense of thirst, and sometimes also of hunger, become much more urgent; there is frequent vomiting of a green or bilious matter, which does not relieve the pain of stomach or the tension of the præcordia. Besides these greenish and black fluids, which are probably different forms of bile, authors have described the matter vomited as sometimes glairy, sometimes cineritious, and sometimes resembling coagulated blood. The patient is tormented with a burning heat and dryness in the fauces; and the saliva, no longer receiving its due admixture of watery fluid, becomes thick, viscid, and adhesive, and frequently accumulating about the glottis of the patient, and thereby threatening immediate strangulation, causes the unhappy sufferer to make every effort to blow it forward out of the mouth. It is the sound made by this effort which produces that faint resemblance to the barking of a dog, and that appearance of froth adhering to the lips of the patient, which have been so absurdly described as characteristic of the disease. Surgeons, who know that suffocation is produced in good health by a little blood from the tonsils being allowed to accumulate about the glottis, will be at no loss to comprehend how this acrid saliva must irritate the sensitive and frequently inflamed fauces of hydrophobic patients, and make them anxiously endeavour to remove it. Besides, they are often at this period seen to labour under such extreme difficulty of breathing that bronchotomy has been practised for their relief; and it is probably to this cause also we are to attribute the anomalous movement of the cheeks and lips described in some patients, and the occasional presence of black blood in the left side of the heart after death. The restlessness, the tremors, the guttural and general convulsions, return now with much more frequency, and are elicited by the slightest causes; the mind becomes much agitated, and in several cases seems quite unsettled during the paroxysms; impatience of the slightest contact with the skin, of light, and of sound, is frequently present to a remarkable degree; and when the pulse and heat of skin are considerable, a person who saw hydrophobia in this stage for the first time might easily mistake it for phrenitis; but the skin is generally cool, the urine natural, the blood yields no buffy coat, the pain of head is inconsiderable, and the delirium transient. The pulse varies extremely in velocity, but is generally quick, and has been counted as high as 150; it is seldom, though sometimes, strong and hard; and the feeling it impresses on the finger as to fulness, creeping, &c., is by no means uniform. Meantime, the powers of nature are gradually suffering exhaustion, under these repeated paroxysms of action, in which muscle and nerve seem alike to participate. The patient, who usually complains of debility from the commencement, whatever force he may be found to exert during the paroxysm, appears to become rapidly weaker, until at length, after one or more desperate exacerbations, life is extinguished. In a few cases he unexpectedly becomes tranquil, and most of his sufferings subside or vanish; he can eat, nay, drink, or converse with facility; and former objects, associated with the excruciating torture of attempting to swallow liquids, no longer disturb his feelings. From this calm he sinks into repose, and suddenly waking from his sleep, expires. Sometimes, on attempting any new movement, he dies suddenly; but in many cases he is carried off from this deceitful calm by a sudden and violent convulsion. In the great majority there is no calm or intermission, but the paroxysms, becoming more and more violent, at length carry off the patient. The muscles remain rigid long after death, and the eyes in some instances retain their peculiar brightness, and the iris its contractility, till the following day (*Gorcy*); nay, in one case the pupil, which had remained constantly dilated during the disease, returned to its natural dimensions after death.

Such is the most general progress of the disease, but there are many varieties observed to occur in different individuals, a circumstance which has given rise to many controversies. At times hydrophobia intermits, and at others remits. From the histories on record it would appear that these interruptions tend somewhat to prolong the duration of the disease, but have no distinct effect in rendering it less fatal. This conclusion, however, is not universal, and the circumstances which lead to these temporary suspensions of hydrophobia are not entirely unknown. The alvine secretion, perspiration, and urine, seem generally to continue in a natural state throughout the disease; but the skin frequently becomes intensely sensible, causing the patient to start or scream with horror on the slightest touch. The settling of a fly upon the surface of the body, the contact of cold air, or of heated air moving in a current, produce the same insufferable sensations and the same tremors. Perhaps the dread expressed of mirrors and smooth objects is rather to be attributed to the patient's associating with them the effects of cold upon this irritability of the skin, than with the torture experienced in the act of drinking. We may probably refer to the same source, the observation of Eudemus (A.C. 23), that the trickling of a tear down the cheek will sometimes excite the paroxysm. In a few instances, however, the skin is hot and dry; in others, it is harsh to the feel, but without heat; and in one or two cases it is described as appearing livid; sometimes it is described as covered with a profuse perspiration. In Dr. Johnston's case, the bowels were confined throughout the whole disease, and so closely constricted was the extremity of the rectum by spasm, that every attempt of the medical man to introduce the clyster-pipe proved fruitless, although made with abundant firmness. In nearly all the cases that have come to our knowledge, the urine was natural, a most remarkable circumstance considering the waste constantly going on from the blood by the saliva, and by the pulmonary and cutaneous exhalations, and the impossibility of introducing a fresh supply of moisture. In a few instances, however, it has been remarked to be scanty, in others of a greenish, and in others of a pale lemon colour. Generally speaking, the organs which excrete this fluid have scarcely been known to be affected with spasm in hydrophobia, although this is a common symptom in hysteria and hypochondriasis, diseases which it resembles in many particulars. In one of Mead's cases, however, (the first,) there was difficulty of passing urine: the patient had "strangury to a great degree, exciting cries on attempting to pass urine; the urine was as well coloured as ordinary." In short, the glandular organs appear to be but slightly affected, and perhaps never primarily in hydrophobia, with the exception of the salivary lachrymal apparatus. Some persons experience an extreme soreness in the scalp on its being touched, and others, as we have seen, have a similar aversion to contact on any part of their surface, declaring that it hurts them; others experience more or less of pain in the region of the larynx or trachea, during the whole or part of the disease; and some have suffered pain and enlargement of the thyroid gland, generally on one side only. During the latter stages of some forms of hydrophobia, the lymphatic glands around the basis of the jaw became sensibly enlarged. Cases are related, in which the first indication of spasmodic action about the neck does not occur in the muscles attached to the basis of the skull, but in the root of the tongue, in the muscles originating from the os hyoides, and it is described as commencing by a sense of rigidity and stiffness merely in that position: on looking into the throat, for the most part nothing is to be seen; but in other instances turgescence and the general signs of inflammation are distinctly visible upon simple inspection. Externally, in some rare instances, the larynx, or the thyroid gland, or the submaxillary gland, have appeared to the medical attendants to be somewhat enlarged.

It has already been observed that those bitten by cats have seldom the dread of water, or the difficulty of drinking it to any great degree; so that to many of them the fable of Tantalus, if ever it alluded to hydrophobia, becomes an allegory misapplied. Such is the notion of Dr. Good, who probably omitted the fear of water from his definition on this account; but the proposition is not rigorously true. In Dr. Vaughan's case of a boy bitten by a cat, he "sobbed deeply at the sight of water, turning away with perturbation." Mr. Bellamy also, and the patient described by Dr. White, (*Hamilton*, pp. 340, 430,) were both distinctly affected with the hydrophobic spasm; and perhaps the only reason for this supposed peculiarity in the bite of the cat, and which has induced this learned nosologist to create two new species, 1, the *rabies felina*, with little spasm, and, 2, the *rabies canina*, with much spasm, has been the simple fact that the cases on record of hydrophobia from cats are too few to afford a firm basis for any inference. In other cases there is no nervous agitation, in others no vomiting, in others no tracheal irritation, in others no fever; many have the respiration nearly free to the last; some await their end with considerable tranquillity, their mind being little disturbed during the whole scene; while, besides those affected in the manner we have described, there are others who become delirious from the middle period of the disease.

Finally, it is not the modification of one individual symptom that is to fix the attention of the medical observers in hydrophobia, but the changes in one or other of those great original groups to which we have said each individual must belong; the chills and flushes, the tremors, the excessive cutaneous tenderness, the intolerance of light, of sound, of pungent smells, the preternatural activity and force of action, the tendency to certain motions, as leaping upwards, running backwards, climbing; the facial, guttural, and thoracic spasms; the great increase of muscular force, the general convulsions, and at length paralysis of the limbs; the amaurosis, and mental aberration, are symptoms many in number and various in aspect, but all flowing distinctly from one source, a nervous system irritated and finally exhausted by the action of the poison: the priapism, spasmodic contraction of the cremaster muscles, and involuntary emissions, which occasionally occur, have the same origin. That satyriasis ever attended these last symptoms in the hydrophobic patients of Britain, we have not been able to learn. There are good reasons for thinking it never did, as being familiarly mentioned by the ancients, it was not likely to be passed over in the great exactness of modern description. French writers, however, assert that it frequently occurs so combined in that country; and the respectable Portal bears witness to his having seen several instances of furor uterinus occurring in hydrophobic women. This is probably another example of variety resulting from the diversity of national education. Many irritations of the nervous centre are known to produce these symptoms, and if they are sometimes occasioned in hydrophobia by spasmodic contraction of the perineal muscles, the origin of that spasm is the same. Neither must it be forgotten that the reasoning powers, the present conversation, and the previous knowledge of a patient, as well as his physical power of enduring pain, will considerably modify all the mental phenomena; and when the fever is vehement, there will be a further change of these phenomena from that cause. The respiratory phenomena must likewise vary according to these leading symptoms; the *sighing* will have more relation to the fever; the *sobbing* more to the nerves. The theory of sighing is well known; but that of sobbing is evidently of the nervous class, and has been traced by Sir Charles Bell to the sole action of the respiratory system of nerves. It is exactly the movement produced by throwing cold water suddenly upon the naked shoulders, and was long since described as such by practical authors. (*Hamilton*, App.) This affection of the respiratory class of nerves lent some countenance to the peculiar hostility of the rabid virus to the eighth pair, to which we have elsewhere alluded.

The changes which take place in the functions of the organs of sense are abundantly curious. At first there is a distinct increase of their power, the exercise of which seems far from disagreeable to the patient himself; and hence the wandering aspect and rapid movements of his eye: he listens to sounds, and detects smells, which no one else can observe. Sometimes he speaks of a disagreeable smell exhaling from the wound, and possibly with correctness, it being no great argument to the contrary that the bystanders cannot perceive it. M. Magendie attended a hydrophobic patient, who, though born deaf and dumb, heard very distinctly during the paroxysms. Neither is the sense of touch at first disagreeable; and one patient whom we attended compared it to tickling. But in a short time they all become affected with pain, and finally with anæsthesia or paralysis; the patient hears indifferently, has numbness in certain parts, the pupil becomes dilated, the sight indistinct, and at length lost. This progress from an agreeable excitement to pain and collapse seems to mark the progress of some mischief accumulating upon the nervous system. The supervention of partial paralysis, paraplegia, and even hemiplegia, tends much to confirm the same opinion; nay, in the case just alluded to there was an universal paralysis, or, in other words, an apoplexy; and we remarked in our notes at the time, that it differed in no respect from a severe case of apoplexy, except that the stertorous breathing was less.

Nothing can be more various than the different frequency of hydrophobia in different countries and seasons. In South America, Syria, Egypt, and Barbary, it is said to be very unfrequent, and indeed scarcely known; even in Britain, where the population is dense, and the chances of multiplying the disorder correspondingly increased, hydrophobia is a somewhat rare disease; and we may meet every day with experienced practitioners who have never seen it. In the mortality bills given in Dr. Willan's able work on the diseases of London, there occurs only one case in the course of five years; and in Edinburgh there has not occurred a single case in the last twenty-five years. On the contrary, it is pretty frequent in many countries on the continent of Europe, as will appear by the following curious statistical table of the ravages made by human hydrophobia in the kingdom of Prussia:

Years	1810,	1811,	1812,	1813,	1814,
Deaths,	104,	117,	101,	85,	127,
Years	1815,	1816,	1817,	1818,	1819.
Deaths,	79,	201,	228,	260,	356.

(*Edin. Med. Surg. Journ.*, 1824.) From this it appears that the deaths in ten years amounted to 1666, or to 166 yearly, which considerably exceeds the number of authenticated cases known to have been put on record throughout the world when Dr. Hamilton wrote his book in 1798. The deaths were most frequent in the provinces of Marienwerder, (228,) and Bromberg, (162.) In Breslau it was 90, in Oppeln 53, in Trier 46, in Aachen 58. On the contrary not a single case occurred in Stralsund; and it was rare (5) in Dusseldorf and in several other places. Hufeland observes that those provinces in which it is most abundant are contiguous to forests containing wolves, to the forests of the Ardennes, of Russia, and of Poland. Hydrophobia is very rare in Sweden. Odhelius declares that the disease is so uncommon that up to his time, 1777, not a single case had been communicated to the Academy of Sciences. Crete, and one or two other of the Grecian islands have been described by the ancients as particularly obnoxious to this disease, whilst it was rare in the adjacent continents; but this was probably the mere result of the greater number of dogs reared in them, the breed of these islands being celebrated all over the world. It is the salacious nature of this animal, and the absence of all limits upon continents to the extent of his promiscuous intercourse, that gives rise to the difference so long observed between the dogs of islands and those of the main land. In islands, the number of breeds, and consequently the number of mixtures, have a limit, and in small islands like those of the Mediterranean, a sufficiently narrow one: consequently a character of breed once fixed will run small hazard of materially degenerating; for every new tendency will be more or less in an intermediate relation between the breed and the medium character of all the other races. It seems not improbable that the innate fierceness and love of independence, with its consequences, suicide, ardour for general liberty, and aversion to foreigners, which philosophers have long imputed to the human inhabitants of islands, particularly those of Britain and Japan, may be owing to a similar circumscription of family intermixture. Analogous facts may be observed in the Celts and Jews; but we omit this consideration to remark that the same insular circumstances that give rise to the peculiar characters of these far-famed breeds of dogs, may also have generated and propagated a tendency to hydrophobia in those animals. In the Manchester Royal Infirmary, which may be considered the central hospital to nearly half a million of population, very few cases of undisputed hydrophobia have occurred within the last eight years, and in private practice we can only hear of ten cases which have occurred during the same time.

Hydrophobia attacks every sex and age without discrimination. Soranus, the ancient methodic physician, had observed it occurring in infants at the breast, and this remark has been confirmed in later times. No temperament, no strength or weakness of body, no mode of existence or habit of life, is spared; and, upon the strictest investigation, it does not appear that any one of these circumstances, though they are known so materially to modify even diseases resulting from specific contagion, has ever produced the least modification of the symptoms in those attacked with hydrophobia. It seems, in particular, to invade alike every class of society: the superior intelligence, cleanliness, and comfort, of the classes raised above the necessity of daily labour, is found to afford them no security; and, considering that their exposure to the exciting cause must be considerably less, there appears to be a full proportion of cases occurring in such persons put on record in the writings of physicians. It must be observed, however, that a great number of those who have been bitten, escape the disease, and that this good fortune cannot be without a cause. Blacks are obnoxious to hydrophobia as well as whites, but in what proportion to the latter has not been ascertained. Some have inconsiderately asserted that men of the Arab race are exempted from its ravages; but this is sufficiently confuted by the familiarity with which Avicenna and other Arabian physicians speak of the disease.

In studying hydrophobia we must avoid a source of error, from which false reasoning and many false facts have flowed from the time of Cælius Aurelianus; who seems entitled to some praise for the invention of a sophism that has been so much employed by his successors, and so well received by the mass of mankind. "If Homer," says he, "knew of dogs, and of the hydrophobic disease to which they are subject, he must also have known of the hydrophobic disease of man; for the disease of the dog is the cause of the disease in man; and if he knew of the cause of the disease, he must of necessity have known the disease itself; for where the cause was present, the effect would naturally follow. By a parity of reasoning it has been inferred, that wherever dog-madness is, there human hydrophobia must also be; that the climates which produce the one must produce the other, and that the symptoms which are produced in the one must be produced or imitated in the other. It is chiefly owing to these extravagant conclusions that we are often unable to discover whether an author is speaking of the disease in man, or of the disease in dogs; that we find all the fabulous symptoms imputed to the mad dog by the first writers, described in the hydrophobia of man by medical authors comparatively modern; and that, up to the present hour, the influence of climate or local position is supposed to exert some influence on the production of this disease. Two things, however, are clear; first, that a place may be for a length of time free from hydrophobia, and yet suffer greatly afterwards from the direct demonstrable importation of that malady; and, secondly, that the disease may be raging amongst the canine race of a district, where formerly cases of human hydrophobia have occurred, and do afterwards occur; and yet from the activity of the police, chance, which gives up only every twenty-fifth person to the confirmed disease, and another series of chances comprehending the confinement, detection, or death of the animal himself, may combine to render the canine disease devoid of all bad consequences at that time, without our being forced to suppose that climate or atmosphere has in the smallest degree interfered. As these facts seem important, we shall illustrate them by a brief example. In 1798 Dr. Hamilton assures us, on good authority, that canine madness had not been seen in the island of Jamaica within the last fifty years.

In 1822, that excellent observer, Dr. James Thomson, of St. Thomas in the Vale in that island, put upon record the following decisive facts regarding the same subject in the Edinburgh Journal. Dr. Thomson had an opportunity of observing the cases of two hydrophobic patients in Jamaica, whose malady resulted from the bite of rabid animals. Upon dissection he did not omit the spinal marrow; but except slight inflammation of the throat, not the smallest appearance of disease was manifested. Neither did he find any thing in the bodies of three different animals which died mad. Simple heat will not create the disease, as it is not more common in tropical regions. Some years ago almost all the dogs in St. Domingo were infected, from the bites of some rabid animals that were brought from America; and it has, since that period, been repeatedly traced to infection from that quarter. It has also been repeatedly communicated to the race of dogs in this island. The dogs kept for the destruction of rats upon sugar estates, are occasionally seized with madness. Dr. Thomson once saw an instance of a goat bitten by a dog, and where mercury was given. The poor creature ran at the mouth terribly for some days; but soon afterwards died mad. He has been informed that herds of swine become occasionally mad, biting and tearing each other. It is obvious, therefore, that the disease has been imported into Jamaica since 1798, at which time it is supposed the island had enjoyed an immunity from it of fifty years; and this immunity, which authors had attributed to climate, was in reality the effect of accident. Insular situation rendered it easy to exterminate the dreadful visitant, and a large period of freedom from its ravages succeeded.

What relation the disease may have to the different seasons of the year, or to various modifications of the weather, will be more properly considered amongst its causes.

Causes.—The most careful investigation by the anatomist has hitherto discovered nothing in the dissection of the bodies of those destroyed by hydrophobia, which throws the least light upon the theory of its cause. The bodies of many patients who expired under frightful sufferings, have not exhibited the slightest indication of disease. In others, an early and careful examination of the fauces discovered no morbid appearance during life; and the few organic changes which have been described in other cases are too various in locality and degree among themselves, and being mere traces of inflammation, are too easily explained as the consequences of the violent straining, and spasmodic action of these parts, and of the acrid secretion, or halitus, whose combined irritation they undergo during the latter part of the disease, to enable us to deduce from them any conclusions as to the seat or the mode through which the exciting cause works out its fatal effects. The details, therefore, afforded by pathological anatomy, we shall do better to reserve for another place; and we now proceed to consider the causes of hydrophobia, in their triple relation of *predisposing*, *remote*, and *proximate*.

With respect to predisposing causes, we have nothing but the most loose analogies: persons of the nervous temperament, and of a feeble habit of body, and melancholic and irritable individuals, are occasionally liable to obstructions of the great functions of the throat, breathing and deglutition; and these impediments appear universally to be of the spasmodic kind. The globus hystericus, the dysphagia sicca, the hydrophobic spasm, spasmodic croup, and even spasmodic dysphagia, are all members of this family, and exhibit the common character of supervening suddenly; not unfrequently, indeed, from mental emotion also, or gastric irritation, particularly dyspepsia. But these are merely evanescent accidents, and have no right to be considered as having the same origin with the terrible spasms of human hydrophobia. On the contrary, we have already seen that the hydrophobia of man occurs in every possible temperament, age, and habit, and it is therefore most illogical to infer that they have any thing in common in their origin. In plain truth, the excitement which produces the spasms in question, produces the same effects in the most robust, sedate, and fixed of human constitutions; and taking their own view of the matter, who is it, of all such speculators, that would dare to assert that he knows the exact measure of force exerted by the cause of hydrophobia? Or that he states on demonstrable grounds, that there ever exists in human bodies an irritability too small in degree for it to produce its specific effects? We say then, that the notion of a nervous or melancholic temperament predisposing to human hydrophobia is an *ex post facto* observation, drawn from what is seen in the symptoms after the disease is formed, and not a genuine clinical remark, chronicled in the latent stages, and confirmed by comparison of cases. The few other predisposing causes that have been occasionally alluded to are too improbable to deserve notice in the present day; being those causes which have been noticed as producing the non-rabid hydrophobia, which are afterwards to be disposed of, and which may very well be allowed to remain in the class of exciting causes of that distinct species, till they have been shown to act as predisposing causes of rabid hydrophobia; an assumption altogether gratuitous, and of which at present there does not exist one instance upon record.

As we advance to the *exciting* causes, however, our information acquires a more satisfactory character. That the bite of a dog, labouring under a particular form of madness, is often succeeded in man by the symptoms above described, and in animals by a disease remarkably analogous, and equally fatal, is a proposition which is confirmed by the testimony of all ages and nations, and has never been called in question by any respectable writer. But numberless, and many of them indeed extremely interesting, questions have arisen out of this admitted fact, and are still occasionally proposed for our solution, with regard to the time, manner, and circumstances under which the apparently trifling injury, which precedes, produces the fatal consequences which follow. Does the disease ensue from the influence of fear alone? And, if so, is this fear created by the terrible appearance of the animals, by the prejudices of the patient, by the apprehension of the medical attendant, or by all these terrors acting together? Is it the simple result of laceration extending, as in tetanus, its irritation from the part wounded to the more susceptible portions of the nervous and muscular system? If so, we are to consider it merely as a form of tetanus, or rather as a different disease originating from a parallel cause? And in either case, would the claws, or other rigid parts of the animal produce similar effects by a scratch? If so, why do the symptoms of hydrophobia differ from those of tetanus? Again, is the disease communicated by a poison or virus which passes into the wound, during infliction of the bite? If so, does it come from the saliva or the tooth, or is it the saliva itself in a morbid state? Is it absorbed into the system, or does it remain in the wound? If absorbed, does it modify the whole blood and secretions, or merely the secretions of the saliva; and does it imbue this in man with the power of communicating the disease? If the virus is not absorbed, by what mysterious operation does it induce distant parts of the system to create a similar virus, and at length to undergo such vehement and fatal action? Into what condition is it passing during the state of recrudescence; and how does it bring to pass the phenomena which constitute this state? How long or how short a time may it remain latent in the human system? Can it act by inhalation or mere absorption? Can man communicate it to his kind, or to other animals? These are questions which, however numerous, require to be considered in the etiology of the present disease.

We have already shown that the disease does not arise from the influence of fear alone, nor is it ever imaginary. The rabid animal is often quite unsuspected when he inflicts the wound; and in other cases the patient is in a condition incapable of appreciating danger, or of connecting in his mind the former injury with his present feelings. The case of Richard Brown, in the Edinburgh Journal for 1810, affords important testimony to this effect. To the inquiry, is hydrophobia merely a tetanic affection, originating in the laceration produced? a fuller answer will be returned in the diagnosis; but order meanwhile makes it necessary to remark, that tetanus and hydrophobia must either be the same or two different diseases. If they are the same, where is the locked-jaw and tonic spasm of tetanus in the latter? The frothy, overflowing saliva, the thirst, vomiting, clonic guttural spasm, tremours, and mental aberration of hydrophobia in the former? In short, what medical man ever mistook one for the other since the days of Democritus? If they are different diseases, why attempt to class them together under the same appellation? No man pretends to explain distinctly how a lacerated wound excites the phenomena of tetanus; and we should be committing the old logical blunder *ignotum exponere per ignotius*, if we coincided with the attempt to explain the operation of the cause of hydrophobia, of which we know so very little, by the theory of tetanus, of which we know nothing. If it be said that there is an analogy between the exciting cases, the spasmodic paroxysms, and the fatal results of the two diseases; it may be answered that this analogy entirely fails in the diagnostic particulars above enumerated; and perhaps still more essentially in the fact, that tetanus never engenders madness or a desire of biting in the lower animals, and is never communicated by a bite from one to another. This last circumstance renders it impossible for us to consider hydrophobia as produced and matured by any series of proximate actions parallel to those which produce tetanus. By the argument of exclusion, therefore, we are obliged to admit the principle of a virus, for we know of no other mode, and we shall find that, besides this necessity, the absolute existence of such a virus is all but demonstrated by many positive analogies. The saliva of the animal inflicting the bite is evidently changed in its nature, being morbidly abundant, viscid, and frothy; wounds inflicted through clothes are less frequently followed by the disease than in those which occur in bare parts, as the hands and face; thus in Oldknow's case above quoted, no recrudescence took place in the scrotum or thigh, because, in wounding these parts, the teeth of the animal had been wiped as it were, by passing through the person's clothes, before they could reach the soft parts within; but it took place in the hand, though the part last bitten, because the animal, which had been forced to let go its former hold only after using considerable violence, had time to shut his mouth and wet his teeth again in saliva, before inflicting the wound. Introduced by a wound into carnivorous animals, it evidently reproduces a similar saliva wherever it excites the disease. In one omnivorous animal, man, the same fact has been proved by Magendie, by means of injection; and from the testimony of Dr. Thomson, above quoted, and many other writers, the same thing seems probable with regard to another, the hog, when introduced by a bite; and the symptoms of the malady ensuing, with the addition of the biting tendency, peculiarly resemble those which take place in man. Amongst the herbivorous animals a large salivary apparatus is necessary for their food, which does not undergo its ultimate chymification in the first stomach: and it is not impossible that the changes produced upon these organs by the rabid poison may be too small to generate the new virus. After all, the virus may be there, but in too dilute and feeble a state to manifest itself in the few rude experiments which have yet been made by physiologists upon this subject.

There does not, however, appear on record any indubitable case or history in which hydrophobia seemed to be communicated from one herbivorous animal to another; but this does not weaken the analogy to virulent poisons observed in the hydrophobic bite of the other two classes. Again, the effects of the bite, like those of a morbid virus, for the most part, manifest themselves within a certain time after its infliction, by far the greater number becoming ill between the thirtieth and the sixtieth day, and a great majority of these again about the fortieth, the day before, or the day after. Every morbid virus, however, presents irregularities in the time of its manifestation, and that which remains the longest latent, by affording time for the occurrence of a greater number of causes for its evolution, must be that which presents the greatest number. Hence it is, that the syphilitic and hydrophobic virus exceed all others, and nearly coincide between themselves, in this irregularity. Nay, the fact that dogs frequently communicate the disease by a bite during this latent period, seems to evince that there is a morbid assimilation in progress long before the appearance of the symptoms; a circumstance which is perfectly in accordance with the idea of a virus; but which cannot well be understood on any other supposition. The train of symptoms occurring in the wound itself, which we have ventured to comprehend under the term recrudescence, correspond very well with the idea of a virus. Why should the wound, after a considerable lapse of time, again become painful, red, and swollen, unless some cause of irritation still remains lurking within it? Why should it re-open after such an *increased* action, of which augmented adhesion is understood to be the only natural result? Wounds re-open in scurvy, purpura, pest, and putrid fevers, because the weakened vessels easily part from each other at their points of inosculation; and cannot, moreover, deposit new matter in proportion to the rapidity with which the recent texture, now almost dead matter, is taken up by the absorbents, and the bond of union is thus first destroyed by the absorbents from within; just as it would certainly be the first to yield to the action of escharotics from without. But the state of the parts seems totally different here; and that they are ultimately separated from each other by the irritation of some matter lodged within the place of the wound, seems proved by the peculiar nature of the ichor discharged, by the eruption which sometimes takes place around the cicatrix at the same period, and by the livid colour frequently observed to surround it. The latter, it is believed, owes its frequent appearance about specific sores to their acrid matter inflaming and contracting the valves of the contiguous veins, by which it is absorbed into the system. Thus, though we cannot give ocular demonstration of hydrophobic any more than of any other virus, its existence rests exactly on the same foundation as that of all others. This virus cannot proceed immediately from the teeth, for their flinty sheath of enamel remains unchanged during the whole disease, and they present no pores, canals, or openings through which the noxious matter may distil, no poison-bag as in the fang of the serpent. The saliva, therefore, is the immediate vehicle of the poison; but it does not follow from hence that the salivary glands themselves are its primitive source. Troillet contends that the virus proceeds from the bronchial membrane of the lungs, which is in a state of inflammation. The tonsils, too, are known to secrete a matter very different from the ordinary appearance of saliva; and anatomy in many cases detects a very fetid product in the follicles of the arytenoid glands of the larynx, which is believed to be the cause of offensive breath during life; and the breath of hydrophobic patients is often observed to be extremely disagreeable. The lungs are in a state of morbid action during a great part of the disease, and the effects of the impingement of acrid halitus from these organs upon the membrane of the fauces become very manifest in certain cases, as in the symptomatic aphthæ of phthisis pulmonalis, and the blistered chops which frequently *precede* mercurial salivation. The virus, then, may either be an addition to the saliva, analogous to that of oxalic acid, which Brugnatelli discovered in it, or it may be the whole saliva morbidly changed; and, at present, in a state of animal chemistry that cannot distinguish between the bland mucilage of gum arabic and the most virulent poison of serpents, the decision of this question cannot be of much importance.

"Is the virus absorbed into the system, or does remain in the wound?" We have above oberved, that if the hydrophobic virus is absorbed, does not specially affect to find its way into the ody through the medium of the lymphatic sysem; it may enter the circulation still more rapidly owever by means of the veins; and the lividity escribed about the cicatrix at the commencement the disease seems to point out this as its actual ourse. To those who suggest that the poison ay remain confined to the part, and thence impart, from its malignant focus, a portion of virus to the blood as it circulates through it, till the whole is imbued, it may be answered that, though the suggestion is possible, we know of no fact, and see no analogy in its favour; whilst, on the other hand, it is matter of familiar observation that all other poisons, under the same circumstances, are rapidly absorbed, and may in many instances be prevented from producing their specific effects by mechanical impediments interposed in the course of absorption. This last analogy is also fatal to the ingenious suggestion that the poison may remain in the part, and by nervous sympathy, or, in other words, by irritation communicated from thence along the nervous system, may dispose that system to produce all the morbid phenomena which constitute the disease, and the vitiated poisonous secretion among the rest: just as we perceive in hysteria, proceeding from the topical irritation of worms, or in the non-rabid species of hydrophobia. In short, a virulent specific poison inserted into a wound, and producing, by absorption, convulsions, fear, contagious secretions, and death, is not only an ordinary, but an almost universal event; but a poison of the same character that should lurk in a small corner of the patient's flesh, obstinately resisting all the powers of absorption for months, and finally, without departing from thence, create a malignant poison capable of reproducing itself through thousands of living beings in succession, would be a fact entirely unprecedented; and as it has not been proved to have happened, is therefore at present only a supposition extremely improbable. There remains, therefore, no just or tenable ground for believing that the hydrophobic virus enters the system in any other way than through the ordinary course of venous absorption. To the questions arising from this admission, we can only attend with propriety when considering the *proximate* cause or *theory* of the disease.

The dog and cat, and animals closely allied to them by natural characters, have alone been proved, by correct observation, to possess the power of communicating this disease. The fox and the wolf are the kindred of the dog; and these, with the latter and the domestic cat, are all the animals which appear upon credible testimony to have produced a genuine rabid hydrophobia by their bite. From all the examples of which the history can be believed at present, it does not appear that age, sex, or variety of breed, or other corporeal circumstances, exert any influence with regard to the disease in these animals. It is true that in Mr. Gillman's account of the death of a sow and her two pigs, all bitten at one time by the same mad dog, whose disease on dissection he fully ascertained, age seemed to have some effect. The pigs were seized respectively on the tenth and fourteenth days after the bite, and the latter died three days after; while the sow was not affected till the twenty-seventh day, and struggled with the disease for five days before she expired: but there are other cases directly the reverse of this result. Indeed the external circumstances which are generally supposed to favour or actually to cause its production in those creatures, are far from being unscrupulously admitted by medical writers. Hunger, putrid food, confinement violent treatment, great atmospheric heat, great cold, suppressed salacity, checked perspiration, the growth of a peculiar hydatid or worm under the tongue, intestinal worms, epidemic contagion, want of water, self-generated contagion, have all been assigned as causes of the appearance of hydrophobia among animals. With regard to hunger, it is known that the pangs of this state induce a high degree of fury in the wolf, but this recedes when his famine is allayed. It is not hydrophobia, and it does not even appear that the dog, whether domestic or wild, even when dying of hunger, exhibits the same fury. Finally, by far the greater number of cases occur in dogs and cats that are highly fed and pampered. Putrid food seems an aliment as natural to the dog as to the vulture or maggot. The greater number of dogs are lured to it from afar by the odour, and feed upon it with delight. The great majority of dogs kept in kennels are fed upon nothing else; and if we except a chance of the disease running through a kennel when once it occurs, hydrophobia is not very frequent among dogs so preserved. Add to this, that many tribes of mankind, as the sturdy natives of Kamtschatka, who abhor all food that has not been some time putrid, are yet far more healthy than others on the same parallel, as the Esquimaux, who eat their victuals fresh; and the undeniable fact that favourite lap-dogs and favourite cats, whose taste has been long rendered too nice by indulgence to eat putrid meat of any description, do yet very frequently become mad, and communicate by their bite hydrophobia to man, and rabies to other animals. Great abundance of carrion, however, by congregating a number of dogs from all quarters, whether healthy or infected, must greatly tend to disseminate the malady. The same must be the result of confinement, where many dogs are kept within the same kennel; and there is very competent authority that the bites of a rabid animal thus enclosed amongst others, may often be traced through a great part of their number, although they are not all seized with the disease, and experience has not proved that confinement usually becomes the exciting cause. It sometimes happens that dogs suspected of hydrophobia undergo very cruel treatment, but this is more frequently after than before they have manifested that irritability, snappishness, or fury, which are generally deemed characteristic of the disease. By far the greatest number, however, of those affected have suffered no violence from man, and it seems much more probable that in almost every instance they derive the fatal poison from infection communicated by the bite of another dog already diseased.

The most common notion respecting the origin of hydrophobia in these animals is, that it is excited by great atmospheric heat, as for example by that of the dog-days; and hence the annual panic in our own and most other countries, the tying up, muzzling, and killing of dogs, and many other sanitary regulations of police during the hot season. That absolute heat will not of itself determine the appearance of hydrophobia among animals has been already established, from the rare occurrence of the disease in tropical countries. Still there is no reason why autumnal heats should not increase the frequency of the disease in more temperate regions; and the consonance of general opinion with the notions of most writers seems to favour the idea. M. Trolliet found the dates at which 114 different dogs had become affected with the disease to spread themselves throughout the whole circle of the year; but the most considerable of them were comprehended in the months of May and September; on the contrary, they were fewest in January and March. The dog loves heat, and delights to saunter about or lie half asleep upon the ground out of doors in warm weather. Hence many more strange dogs are brought into contact with each other, and the chances of infection multiplied; while the excitement produced by the heat may perhaps render them less cautious than ordinary of meeting each other. In point of fact, however, a general register of cases is said to exhibit the disease occurring pretty uniformly through every range of temperature, and every season of the year. Hildenbrant and Roserus conceived that the extreme excitement which in this animal prompts the venereal appetite, disturbs the nervous system so much as to induce a degeneration of the saliva, a change which takes place easily, because the dog never sweats, and consequently the fluids are carried towards the mouth in much greater quantity in this than in other animals. This notion has received some support on the continent, (*Sprengel*, vi.); but it is not easy to see how a state of excitement, which is common to all animals, should produce a specific affection in so few species, and in these again only in a very few individuals; for by far the greater number of animals become mad by having been bitten by other animals. We had supposed, indeed, that the idea of spontaneous hydrophobia had been long since exploded, for the simple and obvious reason that it cannot be proved ever to take place; for we have not yet ascertained all the circumstances under which hydrophobia may be communicated in animals, nor how long the disease may be dormant in their system. So that we should never be safe in asserting that any case was spontaneous, or had arisen without any external cause. Moreover, it is still strongly disputed, whether, from simple irritations within our system, contagious disease can in any case be propagated. Without examples and without established theory, therefore, the notion of the spontaneous origin of hydrophobia, originating at times in the same manner as typhus is supposed to do, from some internal actions, must, like the origin of all epidemics, be referred to the obscure chapter of medical hypothesis which treats of the general origin of diseases. With regard to want of water, no such privation is suffered by a vast majority of the animals from which the disease seems to proceed; and as to the worm under the tongue, it is an anatomical delusion.

We have already alluded to the false, though very general conclusion, that hydrophobia, because it always originates from the same cause, ought always to manifest the same symptoms in whatsoever species of animal, or whatever individual of these species it may occur. Every day's experience refutes this fallacy. The precepts of the Baconian philosophy of induction now triumph over the ancient *à priori* method of conjecture in every question of science; and in the present disease, by enforcing the results of strict observation, have banished from the histories in which it is recorded those imaginary analogies by which, however specious, they were formerly defaced. But the variations of symptoms brought into view by this improved mode of investigation are so numerous and discordant, that the causes of these discrepancies between the forms of the disease as it occurs in different species and different individuals become a fair and legitimate object of inquiry. First then, it must be observed, that in the appearance of the symptoms some modification may be expected from the degree of sagacity or intellect of the animal affected. Man, who is distinguished over all other creatures by the superiority of his reasoning faculties, and by the power of correcting morbid associations by the employment of these faculties, may be well supposed to resist the establishment of many diseased combinations of ideas, originating in the perverted sensations peculiar to this malady, which would instantly have undisputed possession of a quadruped. And thus also in man himself, with adults, so long as there is no delirium there is little or no fear of water, or of circumstances suggesting the recollection of water; but when the delirium is once become high, the person no longer suffers merely from the pangs endured from attempting to drink, but associates in his mind those tortures with the fluids which produce them or matters that resemble them. On the other hand, infants, weak-minded persons, young and stupid animals, seem to yield to this very natural association, and further to combine it with self-preservation almost from the commencement of the hydrophobic attack. On the same principle, it is hardly to be supposed that a carefully educated and sagacious dog will so readily yield to the suggestions of these morbid feelings, or so soon resort to the means of self-defence which in brutes are inseparably combined with attempts to destroy the object of their fears, as would a wild and masterless animal; and this is probably the reason of that indiscriminate fury observed in the mad wolf, now believed by naturalists to be merely the dog run wild, as it probably is the cause why hydrophobia is so often communicated by dogs of which no one knows the owner. Hence it is that wild dogs in this state fly at all things in their way and tear them with violence, while the fully domesticated dog, unless highly provoked, rather snaps than tears. In a most formidable experiment performed on a little favourite dog, in the year 1826, Mr. White, of Brighton, found it no easy matter to induce the animal to bite his arm, although it was so far advanced in the hydrophobia as to die in a day or two afterwards. This may also afford an explanation why many dogs lap water, and even swallow it for a considerable part of the disease; whilst others seem to be completely deterred from it by the great pain it occasions. Thus the sow and pigs described by Gillman, would not swallow fluids, but showed no aversion to the sight of water, although the sow, in addition to the extreme irritability of surface which they all manifested, became subject to that panaphoby, or universal alarm, in which many of the ancients believed the essence of hydrophobia to consist; the older animal thus having sagacity to form an association between pain, and consequently danger, and the contact, sound, or approach of external agents which produce them; while the younger ones did not seem to form the same combination. Besides the influence of sagacity upon the mode of avoiding pain and danger, something may also depend on the physical structure of the throat: the pharyngeal spasm does not always constitute the whole difficulty of swallowing; there is very frequently joined to it a feeling of immediate suffocation, and a terrible oppression of the whole respiratory functions, somewhat resembling the worst forms of asthma. When these are wanting, the patient may be more easily enabled to overcome the spasms of the pharyngeal muscles; when they are present, he will be deprived of this power. Finally, this effect may be considerably modified by the force and direction with which the pharyngeal spasm happens to bear on the opening of the larynx; and all the results may be greatly modified by the state of augmented sensibility, or by the absolute inflammation, perhaps, which exists in those parts.

Having premised these sources of variety, we shall briefly state the symptoms which generally appear in the dog; and which are, after all, abundantly akin to the symptoms of human hydrophobia: but as a great deal of error and certainly little benefit has hitherto been derived from their study, we shall, in a dictionary of human diseases, consider ourselves entitled to treat the malady of the dog with great brevity, and to pass over that of the other animals in perfect silence. Some time before the hydrophobia makes its actual appearance in the dog, he exhibits some singular departure from his ordinary habits, such as picking straws, threads, or small bits of paper, from the floor; licking the noses, &c., of dogs, or other animals with which he is domesticated; becoming suddenly attached to animals formerly regarded with indifference; licking cold surfaces, as cold stones, or cold iron. He is observed to be shy, lonely, and irritable; he avoids the approach of other dogs, and sometimes of man, and appears to be less eager for his food, or altogether to neglect it; his ears and tail frequently droop, his look is suspicious and haggard, and sometimes, from the very commencement there is a slight redness and watering of the eyes. In a short time saliva begins to flow from his mouth, and passes by degrees into a viscid foam. Respiration is difficult, and performed with panting; the tongue hangs out of his mouth. At this period, inspection of the fauces often shows them to be red and inflamed. He has fever, the skin is sensible to the touch, but he still obeys the voice of his master, though now easily provoked to snap at other objects. In many dogs the signs of fury never rise higher than this; but in all there is a repugnancy to control, and a readiness to be roused to extreme rage on the appearance of a stick, whip, or other instrument of punishment; and all attempts at intimidation only serve to increase their rage. Nevertheless, indiscriminate aggression, and unprovoked fury are occasionally to be observed determining all the motions of the rabid dog; he flies at every creature he meets, bites all the dogs, and gnaws the wood of his kennel; and when admitted into a field where sheep, goats, cattle, hogs, geese, or other timid unoffending animals are collected, he tears and pursues every individual of the flock he can approach. The cat is an early object of his rage, and even the horse and elephant have not unfrequently sunk under its baneful effects. Vomiting frequently precedes or accompanies the disease, the respiration appears laborious, tremours are frequent, and the animal is at length destroyed apparently by convulsions. Inspection of the dead body exhibits, with the same irregularity, phenomena entirely similar to those detected in the bodies of the victims of human hydrophobia. It is generally believed that the latent period is shorter in dogs, and indeed in most animals, than what it appears to be in man, but this point is not very well ascertained, and there is abundance of evidence of the poison having remained in the dog for several months before the disease was produced. Nay, it seems pretty certain that he has frequently communicated hydrophobia to man and other animals during this apparently latent period; a circumstance which shows that the virulent assimilation is even then going on in the animal's fluids; and suggests great caution in our intercourse with these creatures.

Many have asserted, from Aurelianus downwards, that dogs occasionally communicate hydrophobia to man, to their own species, and to other animals, by their exhalation and saliva alone, without inflicting a bite. To inspire the visible vapour they exhale, to receive their saliva upon the skin or into the mouth, even to be scratched by their nails, or by the nails of a cat, has been supposed to be sufficient to induce the disease. There are certainly a few cases related of hydrophobic patients which seem to come under this description; but as has been well observed by Dr. Bardsley, it is much more probable that, in such cases, some small portion of the cuticle had been deficient at the part with which the saliva came in contact, and thus afforded all the facility of a wound to the conveyance of its poison into the system. The ancients were well aware of the possibility of this, for Celsus observes that the integrity of the lining membrane of the mouth is necessary to the operations of the Psylli; and Dioscorides expressly orders those who were to suck out the poison of a rabid dog, first to wash their mouth with astringent wine, and afterwards to lubricate the cavity with oil. With regard to dogs, Mr. Meynell observes, that such of them as have been thought to become affected merely by the contagion of the same kennel, will generally be found, upon minute examination, to exhibit the marks of bites, although concealed by the hair from ordinary observation. With regard to the effects of a scratch, these resolve themselves into the great probability of part of the saliva of the rabid animal having been introduced by the claw which produced it, or having afterwards fallen upon the open wound. In fact, both dogs and cats do very frequently present their foot to the head or mouth, when affected by any uneasiness in that quarter; and they frequently rest themselves with their head reclining upon the fore paws. All such cases, however, are comparatively rare, and there is reason to suspect that many of these histories were examples of non-rabid hydrophobia. From what we know of the great absorbing powers of the lining membrane of the stomach and lungs, it seems not improbable that the poison, if introduced into the saliva, as by kissing a rabid animal, by admitting pieces of cloth, leather, sticks, and the like, impregnated with the same saliva by its bite, into the mouth, the venom might find its way to the stomach and even to the trachea and lungs, and thence, by absorption, be received into the system; and there are some very positive testimonies on this head extant among the older authors; but nothing satisfactory of the kind has been observed during the last two centuries: and we feel ourselves compelled to pause before we admit the inference. The same caution must be observed with regard to the many animals, in addition to those above mentioned, which have been named by medical writers as the propagators or victims of hydrophobia. The camel is alluded to by Aristotle; the leopard, the bear, the horse, the ass, and the game-cock are mentioned by Aurelian, as animals propagating the disease; Penada (Saggio, &c. 1793,) has recorded a case of hydrophobia resulting from the bite of an insect; and the lion and tiger are vulgarly believed to be capable of producing the same effects. Later investigations seem to show that the herbivorous animals do not easily communicate the disease; but the whole evidence adduced is jejune and meagre, and the paucity of cases of communication may entirely result from the pacific disposition of such animals. It is the nature of the carnivorous to be easily roused to rage, combat, and violence. The Author of nature has made them so, because by combat and violence he hath destined them to support their existence; but the pacific races that crop the flowery mead, and participate, without resistance, in the bounteous repast with which they are everywhere presented, have neither habits nor motives which febrile or nervous irritation might prompt into violent action: and into them the same great Author has instilled fear only as a motive of flight, seldom as a motive of aggression or resistance. Hence, probably, the extreme paucity of their bites altogether, and the assertion that they never reproduce the disease; an assertion which we look upon as calculated to diminish circumspection, and to inspire more confidence than is warranted by the evidence upon which it is founded: we wish that in hydrophobia no other conclusions had been originally drawn from such slender premises, and afterwards expanded into general laws.

It would be of much importance to ascertain, out of a given number of persons bitten, the actual proportion that become affected with hydrophobia. It is difficult, however, to come at any thing like distinct truth upon this point, apparently so obvious: for the dog is either immediately killed or tied up, and, consequently bites only a small number, or he runs wild in the country, so that the number of his victims cannot be ascertained. Mr. J. Hunter, however, asserts that he knew an instance in which, of twenty-one persons bitten, only one became affected with hydrophobia; Dr. Hamilton seems to think that one out of twenty-five becomes affected. In 1780, a mad dog in the neighbourhood of Senlis took his course within a narrow circle, when he was killed, after having bitten fifteen persons, of whom three afterwards died of hydrophobia. The French government ordered the most eminent physicians to resort to the spot, examine the cases judicially, place the patients in hospitals, &c.; so, though the original number is too small to warrant a strong inference, yet it presents the proportion of the number bitten to the number ultimately infected in one instance with exactness. At Brive, a wolf bit seventeen persons, and of these ten died hydrophobic.

The causes which are said to produce the non-rabid form of hydrophobia, having no great connection with each other, and being incapable of inducing a successive propagation of the disease either to animals of the same or of a different species, they cannot be supposed, as yet, to have all come to our knowledge :—

1. Superficial wounds, particularly of naked and prominent parts.
2. Nervous irritation of various kinds.
3. Violent intermittent fever.
4. Injuries of the brain and spinal chord.
5. Morbid conditions of the stomach.

The symptoms of the disease induced by these causes do not differ materially from those which result from rabid hydrophobia, and we therefore supersede the unprofitable labour of repeating a detail of these indications. Whoever wishes to consider them minutely will find the particulars of many cases, at great length, in the article *Hydrophobie* of the *Dictionnaire des Sciences Médicales*, and the same condensed, we may be allowed to say, not with great skill, in the *Dictionnaire de Médicine*. Perhaps the best case of the kind on record is that of Lindsay, which occurred from hunger, excessive labour, and mental anxiety, and has been described with great care by Dr. S. Bardsley in his valuable Inquiry into the Origin of Canine Madness. It may be remarked that Lindsay must have long laboured under hypochondriasis; for a man that could remain, as he relates, from 1782 to 1794, in the constant dread of his family dying of hunger, without having once suffered it in all the twelve years that intervened, either wanted the usual powers of generalization common to other men, or was no stranger to the disease characterized by a *metus mortis a causis non æquis*. Lastly, the symptomatic forms of hydrophobia must, in a great measure, be referred to their nosological arrangement given above. We do not hold ourselves answerable for a disease, more or less than appears there, having exhibited symptoms of hydrophobia. Observation cannot yet be complete in this respect; and it is certain that our means of judging of the veracity and discrimination of writers describing such cases are very far from being in that state. They are quite unimportant as regards idiopathic hydrophobia; because hitherto no connection has been established between them; and it is seldom that the disease in which symptomatic hydrophobia originates is better understood than hydrophobia itself. It follows that the only proper place for the consideration of such anomalous symptoms is under the disease in which they arise.

The proximate cause or theory of hydrophobia demands particular attention. Empirical trials, of which the practitioner often thinks but too highly, confounding what succeeds with the ordinary progress of nature, powerfully modified by external circumstances, have held out no flattering unction to human vanity here. Every thing has been tried, and every thing has failed. And unless reason shall discover so much of the theory of hydrophobia as enables us to resist the evil or counteract its commencement, the malady must be given up as incurable; as one certainly for which there is no longer any hope from experiment. It will not be much to the profit of the reader, however, to record every extravagance which may have escaped the profession during two thousand years of ceaseless speculation upon this topic. We shall, therefore, content ourselves with chronicling a few of the most remarkable opinions that have come down to our own times, several of which have been adopted by different sects in the medical world.

	B. C.
Democritus	400
Gaius, brain and motor nerves, 8th pair	200
Asclepiades, stomach	105
Astorius, stomach	30
Themison, thirst and strictum	30
Artemidorus, in the stomach	30
Dioscorides	30
Celsus	18
	A. C.
Aurelianus, deficient moisture	230
Galen	230
Mead, fermentation of nervous fluid producing fever	1720
Dessault, worms	1738
Push, malignant fever	1798
Bosquillon, imagination	1809
Dr. Read, spinal marrow	1819

Having already shown beyond all rational contradiction, that hydrophobia is certainly the result of a morbid poison introduced into the system of the animal which it affects, the modus operandi of the exciting cause, according to these various hypotheses, becomes much circumscribed. For example, if, with Mead and Rush, we consider hydrophobia as a fever, then must the inoculated virus be allowed to produce it after the manner in which the exanthematous viruses produce their respective febrile eruptions, or the different miasms, when inhaled, engender fevers. Of course we can make no allowance for Dr. Mead's perversion of the nervous fluid, as it is no longer believed to exist. But there is no more difficulty in comprehending how the rabious poison may produce its peculiar fever and spasms, than why the poison of small-pox produces a severe fever, often with convulsions and vomiting, and a severe inflammation of the muco-cutaneous membrane; or why the infection of pertussis produces a fever with peculiar spasmodic coughing, and a copious discharge from the mouth and fauces. Nor is there any more difficulty in comprehending these latter effects, than in conceiving why croton oil, introduced into the circulation by abrasion or puncture, excites violent action in the bowels; tartar-emetic in the stomach; and squill in the kidneys. They are the simple result of that original quantity of irritability wherewith these parts have been furnished, and by which alone they become susceptiile of the influence of the given irritant applied in a certain dose.

Diversity of property, whether of organic or inorganic structures, is the great beauty of creation, and constitutes the essence of individual natures, or that character by which they are distinguished from every other thing, and are thus solely the things they are. It is the principal medium through which its divine architect conserves the actions of the machine, which, in this sense, become just so many fulfilments of his original purpose. Such effects of external upon susceptible bodies differ in little from the action of an acid upon an alkali, being equally the result of special properties previously impressed upon each; and are facts not to be explained but observed. The blood of an animal imbued with the canine poison may have its power of irritation exactly in that degree of modification which produces most vehement effects upon the nerves of voluntary motion, and upon the distributions and connections of the eighth pair; and yet not to be in a state capable of effecting the least impression upon the liver, spleen, kidneys, or uterus: and, on the other hand, the motor and pneumogastric series of the nervous system may be originally endowed with exactly such a degree of susceptibility as enables them to originate those high indications of excitement which they exhibit in hydrophobia, with frequent febrile re-action whenever the virus is applied to them through the medium of the blood. The peculiar effects of every individual virus hitherto discovered, prove that this mutual coaptation of the stimulus and sentient fibre to each other is not merely a vague supposition of what may be, but an actual induction supported by the analogy of every known example of inoculated virus. We repeat then, that this notion of the hydrophobic poison producing great nervous irritation and fever, from which all the other phenomena naturally result, is far from being wild and fanciful; and, independently of the names of its distinguished authors, merits due consideration. It has the advantage of embracing nearly all the phenomena, as it is not necessary that the fever should appear on any particular day, or appear at all, just as we see obtain in tetanus and hooping-cough; neither when it does come, does there seem much excuse for so keen a verbal critic as Dr. Rush terming it *malignant*. The vomiting, gastric pain, appearances on dissection, as well as the peculiar character of the matter ejected, the thirst and spasmodic irritation of the throat, and the necessity of some portion of the acrid saliva being received into the stomach, are circumstances which have induced many distinguished men to believe that the virus first exerts its malignant influence upon the stomach, and from this, as a centre, radiates its action to the most distant points of the system which have any consent with the stomach, by that sympathetic irritation which we see prevailing in so many gastric diseases. This view is also ingenious, and comprehends a great many of the phenomena of hydrophobia; but it appears liable to some fatal objections; it does not explain the total absence of gastric symptoms in many individuals, and of traces of disease in the tunics of the stomach in many others; and there is frequently no rejection of solid food by hydrophobic patients, or of solids and fluids by dogs, as happens in gastritis, and might be expected to take place if the stomach was in any way the primary seat of hydrophobic irritation. The affection of the respiratory organs also, seems quite too violent to be an effect of mere gastric irritation.

Still less tenable was the ancient hypothesis, that the virus of the mad dog first acted upon the liver, producing a large secretion of black bile: that this black bile accumulating, frequently gave rise to the symptoms of melancholy and hypochondriasis, diseases which were then supposed to be produced by that fluid: that the black bile then made its way into the stomach and excited hydrophobia, very much in the same way we have just sketched. There is no black bile, and the occasional appearance of bile in the stomach is the effect of the vomiting, not the cause. The same series of objections apply to the opinion which refers the principal focus of hydrophobic action to simple inflammation of the pharynx and larynx. or of the two former, or of the latter alone; in all these situations the marks of inflammation are often entirely absent. The sensibility of the fauces, the copiousness of the salivary secretion, the thirst and suffocating spasm, bear no proportion whatever to the presence, absence, or degree of these traces of inflammation which scarcely ever appear at the commencement of the disease, and are therefore consecutive of some other and later part of it. Besides, the general sympathies of the fauces are not very extensive, and they are so ordinarily the seat of inflammation that it would not be rash to assert that no one case out of a million exhibits a regular specimen of hydrophobia, even in its non-rabid form; while scarcely one case in a hundred is without a regular display of them in the rabid form. This consideration mightily reduces the number of chances in favour of the phlegmasian hypothesis, which counts many able supporters.

Authors have conjectured that the initial seat of the virus might probably be somewhere in the respiratory apparatus, in the larynx, bronchi, lungs, diaphragm, thoracic muscles, or all of them together. This conception has certainly the advantage of coinciding with appearances at a very early stage of the disease, in which frequent sighing, a panting motion of the chest, uneasy respiration, an occasional sense of suffocation and fainting, are generally experienced: it has the further advantage of explaining what takes place in the pharynx, gullet, and stomach, much better than the assuming these symptoms to be primary; and elucidates the perverted state of respiration considered as their consequence. But the theory affords no rational explanation of the fever, the mental aberration, the salivation, the tremours, the spasms; and these objections seem fatal; for no theory of a disease can be admitted which leaves as much as it illustrates unexplained. We have said enough when we mention M. Dessault's theory of organic worms; of which the day is long past.

It seems hardly necessary to observe, that those ancient authors of the Alexandrian school, who ascribed the seat of the disease to the brain and its membranes, merely did so because they considered these organs as the primary origins of the nerves; the nerves of sense being conceived to proceed from the mass of the brain and spinal marrow, while the nerves of motion were believed to spring, by small roots, from the membranes that invest them. This is also the comment of Aurelianus, and we are warranted therefore in affirming that their theory of hydrophobia differed not essentially from that of Mead and Rush, and does not therefore require to be considered apart; since, like these authors, almost all the ancients admitted the absorption of a virus. Themison, Aurelianus, and others of the methodic sect, conceived that the virus inflamed and dried up the blood, thereby producing a deficiency of secretion in the fauces and gullet, great thirst, and a general constricted state of the system. In short, it was a well-marked example of the *strictum*, and accordingly directed all their efforts to subdue this state of rigidity by introducing fluids into the colon, plunging the patients into water, and other contrivances. M. Magendie's method of injecting tepid water into the veins might be expected to answer the same purpose; but it is impossible to prove the existence of constriction in hydrophobia; thirst is not always present; and the whole theory has been long since exploded, as incompatible with the doctrine of the circulation and with the general principles of pathology.

Of late years, since the experiments of Legallois, Wilson Philip, and Magendie, [and Dr. Marshall Hall], respecting the structure, function, and relations of the spinal cord have become so justly celebrated, Dr. Reid of Dublin, and several continental writers, have endeavoured to revive a part of the above ancient theory, and to replace the principal seat of hydrophobia in the spinal marrow. Some slight dilatation in the vessels of this part, and vestiges of inflammation noted in one or two dissections, seem to be the only new facts upon which, in connection with the light thrown upon the spinal portion of the nervous system by those experimentalists, this idea is at present supported. But it leaves the mental phenomena, the salivation, the spasms of the face, the tenderness and unnatural appearance of the skin, the gastric, and particularly the diaphragmatic irritation, altogether unexplained; for it is scarcely necessary to observe that the nerves of the stomach and diaphragm originate much above the points where such congestions are observed; and which, though they be often totally absent, are not therefore to be totally denied, since both men and animals (Gillman's pigs for example) often exhibit a distinct paraplegia some time before death. It is not improbable that the paraplegia here alluded to in man is that which has given rise to the numerous fables of the older authors, of hydrophobic patients rolling themselves up like a ball, crawling on all-fours, and attempting to lap water in the horizontal posture, like a dog, &c. "In a state of despondency," says Dr. White, of Bury St. Edmunds, "and with agonizing groans, the patient threw himself down, as we thought, in a corner of the room, and soon after crawled about in a restless manner, dragging his legs after him, which proved to us that he fell on the floor from his lower limbs being palsied."

Amidst so many ingenious hypotheses, if we are finally asked which of the number appears to us to be on the whole the most consonant to reason, we at present say that an explanation of the phenomena which does little violence to the recognised principles of pathology may most easily be drawn from the first, which assumes that the imbibed virus, like most other poisons, mainly and initiatively spends its force upon the nervous system. It is a well-known fact that all severe injuries inflicted upon this system, whether in the way of stimulus or depression, manifest the gravity of their influence most remarkably in that series of organs supplied by the eighth pair: and conversely, experimentalists, as M. Desmoulins, have found that the smallest pressure even of a drop of blood upon the origin of this nerve in animals almost instantly extinguishes life. The affection, then, so strongly marked, of the parts supplied by this nerve in hydrophobia, and the curious circumstance of its never extending its ravages below its pneumo-gastric termination, may perhaps be considered merely as an index of the deadly virulence of the cause. Still we have shown above that there is no difficulty in comprehending, with the ancient Gaius, that the poison of rabies exerts a peculiar inveteracy of action upon the origin of the respiratory column and the commencement of the eighth pair, just as the vomiting, dysphagia, and laborious respiration, occurring from a violent blow on the head, may either be assumed as the known ultimate effect of general compression, or as a modification of these by some special injury at the same time inflicted on the origin of the same pair.

Diagnosis.—Properly speaking, there is scarcely any disease that a careful practitioner would confound with hydrophobia; but in cases where no rabid impregnation is suspected, the disease may be mistaken for phrenitis, mania, fever, or tetanus; and, in the incipient stages, for melancholy, hypochondriasis, and hysteria. It can only be mistaken for any one of the three latter during a few hours from the commencement. Hysteria and hypochondriasis advance by slow degrees, and rarely have fever, difficulty of respiration, tenderness of skin, or salivation. Melancholy is altogether a chronic disease, and never has convulsions, spasms of the throat, dread of water, difficult respiration, and vomiting among its symptoms. It is true that phrenitis, and what was long classed as a form of it, delirium tremens, have tremours, suspicious fears, tenderness of skin, convulsions and difficult swallowing; but there is no affection of the stomach or respiratory system, no vomiting, no salivation: nay, spasmodic difficulty of swallowing occurs not in one case out of a hundred. From mania it is distinguished as soon as the spasms, difficulty of swallowing, and salivation appear. Indeed the mental aberration, the aversion to certain objects, and the fever which is occasionally present in both, seem to be almost the only points of resemblance. Dr. Rush has entered into a long argument in order to evince the identity of fever and hydrophobia; but though hydrophobia has fever, it does not follow that hydrophobia is the same thing as fever; or, in other words, is fever alone. In short, we have often repeated that in many cases of hydrophobia fever actually supervenes; and that where it does occur, it is seldom a primary symptom. The distinction of hydrophobia from tetanus has been made the subject of much discussion. The two diseases seem first to have been compared with each other by Democritus; but it cannot now be known whether he, or indeed any of the ancients, considered the apparently tetanic phenomena of hydrophobia to arise from the wound alone. On the contrary, they seem almost all to have admitted the existence of a virus; and from the earliest periods to have attempted to account for the symptoms by the operation of this poison upon some peculiar series of organs, from the excitement of which they conceived all the visible symptoms to proceed. Democritus traced it to the tendons or muscles; the followers of Herophilus and Erasistratus, the great discoverers of the functions of the nerves, naturally referred the virus to that system; Asclepiades traced it to the stomach; the methodists to their favourite *strictum*, &c. But none who admitted the reality of the disease appear to have disputed the existence of the virus.

Dr. Mease, of Philadelphia, in 1793, published an able work on hydrophobia, in which he contended for the uncertainty of the virus, and makes out hydrophobia to be purely a nervous affection. Charles Bader, in a dissertation on hydrophobia, published 1792, maintains that there is much less of contagious character in hydrophobia than is generally believed, and draws a formal parallel between tetanus and hydrophobia. The non-rabid form of hydrophobia is occasionally symptomatic of tetanus; and both tetanus and hydrophobia seem to originate most readily from a small punctured or lacerated wound. Both exhibit signs of recrudescence in that wound a short time before the spasms supervene; both exhibit paroxysms of universal convulsion, and occasionally fever, and both carry off a great majority of patients before the sixth day. These are the chief circumstances in which the two diseases agree; and to appeal to more minute but very uncertain points of correspondence, as has been done by the writers who contend with such zeal for their identity, would add nothing to the justness of the comparison. But we have already shown, when discussing the questions respecting the modus operandi of the cause of hydrophobia, that there intervene many undeniable discrepancies between the two diseases; and to these many others must be added. Tetanus, as its name implies, consists essentially in a *tonic* spasm, generally occupying the muscles of the lower jaw, of the neck, of the spine, and the limbs; of the thorax, abdomen, and diaphragm; and always observed more to affect the extensors than the flexors. These contractions of the muscles are occasionally relieved by intervals of ease, but never by entire relaxation; nay, in successful cases, Dr. Currie assures us the deep indentations made in the face by the terrible contractions of its muscles are visible afterwards for many years, and imprint on the countenance a severer character than it previously possessed. A stiff immoveable state of the lower jaw, scarcely to be overcome by any ordinary force, is present during almost the whole of nearly every case of tetanus, and has acquired, for that variety of the disease in which the muscles of the spine are little extended, the name of *trismus*, or lock-jaw. On the contrary, the spasms of hydrophobia are always *clonic*, that is to say, they are always of brief duration, and are succeeded by a period of complete relaxation, generally of many hours duration in the beginning of the disease, unless provoked by attempts to make the patient swallow; and even at the last fatal paroxysm, tonic spasm, and particularly locked-jaw, are very seldom to be observed. A discharge of saliva is an exceedingly rare occurrence in tetanus; in hydrophobia it is a general and characteristic symptom. Thirst is rare in tetanus; it is characteristic of hydrophobia. Vomiting and gastric pain or uneasiness scarcely ever occur in tetanus; they are so general in hydrophobia as to be mistaken by many for the essential circumstances of the disease. It is only in rare forms of tetanus that attempts to drink bring on guttural spasms, a dread of fluids, and their violent rejection when introduced; but in hydrophobia this is the pathognomic trial which fixes the character of every case, with a very few unimportant exceptions. In tetanus, the mind is almost always clear to the last; in hydrophobia, almost from the beginning, numberless deviations from the usual habits of thought and action indicate an incipient stage of mental aberration, which often passes on to delirium or raging madness. In tetanus, fever is rarely present; in hydrophobia, it is frequently present. From tetanus, many recover; from hydrophobia, none recover. Tetanus takes its rise from cold or from any sort of wound; hydrophobia from the bite of a rabid animal. Tetanus, though the usual result of small punctured and lacerated wounds, rarely follows from the bite of a rabid animal; hydrophobia with much greater frequency in proportion to the number of persons bitten, it is said so much as one out of every twenty-five. Tetanus seems more frequent in warm climates; hydrophobia in cold climates, or at least indifferently. Tetanus seems to occur almost any time after the injury; hydrophobia chiefly from the thirtieth to the sixtieth day. It has never been contended that the bite of a tetanic animal communicates tetanus; but it is acknowledged that the bite of a hydrophobic animal communicates hydrophobia. The countenance of a tetanic patient bears no resemblance to the physiognomy of hydrophobia: in the former the eye is natural, and the general aspect is that of suffering; in the latter, the eye is preternaturally bright and glistening, the face occasionally exhibiting frightful convulsions, and the pain of the diaphragm is not characterized by a constant sense of the sternum being dragged towards the spine, as is the case in tetanus; while tetanus, on the other hand, scarcely ever exhibits that laborious panting respiration, that tremour of the whole muscles, and that intolerant sensibility of the surface and of the organs of sense, which distinguish hydrophobia. Indeed it is perhaps only by reasoning upon the uncommon as if it were the ordinary case, that any person, although exposed to the illusion of his own ideas in the retirement of his closet, could mistake the one disease for the other.

Morbid Anatomy.—Whoever pursues with care and attention the various dissections of hydrophobic patients which have at different times been published, will be obliged, however reluctantly, to admit that the pathology of rabies canina is still involved in considerable obscurity, and that no distinctive pathological character of the disease has as yet been satisfactorily determined. The *brain* has been examined with much care and attention. In some instances the dura mater has been found to assume a darker hue than usual. The capillaries of the tunica arachnoidea and pia mater have also been met with minutely injected with blood. This state of these membranes occurred in the dissection of a case published by Dr. Marshall, as well as in several others on record. Trolliet has noticed the gorged condition and dark colour of the plexus choroides. Effusion of serum has been observed between the dura mater and tunica arachnoidea; between the latter membrane and the pia mater; between the pia mater and brain; and also in the ventricles. The substance of the brain itself has been detected in a harder state than natural in one or two instances; in others, it has been found to have undergone a certain degree of "*ramollissement*." Both Bonetus and Lieutaud, however, have alluded to cases in which this organ presented no marks of disease.

Inflammation of the *pharynx* and *œsophagus* has been noticed in several dissections of hydrophobic patients; but cases are on record in which no inflammatory appearance in these parts has been observed. On examination of a patient of Dr. Rutherford's, who died of rabies canina, Dr. Monro was unable to detect any morbid alteration, either in the pharynx, œsophagus, larynx, stomach, or intestines. In one instance it will be shown that we have met with an abrasion of the internal membrane of the œsophagus. In a fatal case of this disease, too, related by Dr. Ferriar, a morbid appearance presented itself in the lower part of the œsophagus. About two inches above the cardia, the epidermis of the œsophagus was abraded in irregular points, and exposed an inflamed surface of a dark red colour; still lower, the abrasion became linear and extended into the stomach itself. The edges of the epidermis surrounding the abrasions were unequal and elevated. A similar affection was traced along the lesser curvature of the stomach, but growing fainter in its progress to the pylorus, where it was least discernible, and about which it seemed to terminate. The whole of the inflamed parts bore a striated appearance resembling the effect of corrosion, darkest in the œsophagus, and lighter and more indistinct towards the pylorus. In two cases mentioned by Dr. Vaughan no inflammation of the œsophagus appeared on dissection. The *internal coat of the stomach* has been discovered in a highly inflammatory state in not a few instances of rabies; and dark purple-like suffusions have also been observed upon it. This organ has also been found to contain a smaller or greater quantity of coloured matter. It has been supposed that this inflammatory condition of the mucous membrane of the pharynx, œsophagus, and stomach, satisfactorily accounts for the sense of suffocation, extreme thirst, morbid antipathy to liquids, and burning heat along the whole œsophageal tube, mostly experienced by the hydrophobic patient; but it must be recollected that such a state of these parts is by no means constantly present, as is proved from the cases related by Dr. Hamilton and other writers; and hence it is not essential to the existence of the disease. From the examinations of M. Trolliet, it appears that the mucous membrane of the *trachea and bronchi* afforded evidence of inflammatory action, and was covered over with a considerable quantity of frothy mucus; and the membranes of the brain, particularly the pia mater, exhibited marks of great vascularity. The frothy matter he supposed to be the product of the inflamed mucous membrane. "La bave écumeuse des hydrophobes," he observes, "est un produit de la membrane muqueuse enflammée, puisque nous l'avons toujours vue dans les parties des voies aeriennes où cette membrane étoit vivement colorée, et qui étoient le siége de la douleur. Elle est chassée sur les lèvres de l'hydrophobe dans la dernièr période de la maladie, comme le mucus altéré dans l'agonie d'une personne affectée de phthisie ou de catarrhe, lorsque la respiration est stertoreuse et laborieuse." Lalouette has also noticed this peculiar frothy matter in the trachea and bronchi:—"Une humeur," he remarks, "que l'on peut comparer à une salive écumeuse qui enduit toute l'arrière bouche ainsi que le larynx, le pharynx, la trachée artère, et les grosses divisions des bronches. Elle se trouve en plus ou moins grande quantité chez les différens sujets." That the lining membrane of the trachea and bronchi is sometimes in a state of inflammation cannot be denied, but we are satisfied that Trolliet's view of the pathology of rabies is too limited; for it will be found, upon a comparative examination of the number of dissections of hydrophobic persons on record, that the stomach has been more frequently met with in a morbid condition than the trachea, bronchi, or any other part of the body. The *salivary glands* have occasionally been observed of increased size and vascularity. In some instances there has been inflammation of the pulmonary tissue, but more frequently great venous congestion.

Dr. Ferriar was almost disposed to consider the disease as dependent on the obstruction of the pulmonary circulation, but his conjecture has not been supported by subsequent pathological investigation. The *pleuræ* have been noticed in a thickened and inflamed state; and we meet with fatal cases of hydrophobia in some of the earlier medical records, in which *various derangements* of the *heart, pericardium, liver, spleen,* and *mesentery* are described; but it is impossible to peruse these dissections, without being convinced that the morbid changes enumerated are merely accidental, and the result of other causes than the virus of rabies. Some pathologists of eminence, amongst whom may be mentioned the names of Salin, Brera, Sanders, and Reid, supposed that they had satisfactorily proved that the symptoms of hydrophobia proceeded from a morbid condition of the *spinal marrow*; but it may be correctly stated that their opinions have not been confirmed by the general experience of the profession. In some examples of this disease, (as in the two which we shall notice,) unequivocal marks of vascularity of the membranes of the spinal cord have been present; but, generally speaking, not the least vestiges of inflammatory action either in the medulla spinalis or its investing tunics have been discovered. In one instance, related by Mr. F. Godrich, the whole cord was considerably inflamed; and opposite the two last cervical and dorsal vertebræ the cellular substance was studded with dark patches of coagulated blood, the thecvertebralis thickened, and the cord in an active state of inflammation. The larynx and pharynx bore not the slightest vestige of disease. We may, however, venture to assert that no such connection as that of cause and effect exists between an inflammatory state of the spine and the phenomena of hydrophobia; for it is well known that effusion of serum into the theca vertebralis, and other signs of increased vascular action in the spine, have been frequently met with in diseases very different from the one under consideration.

As dissections of hydrophobic patients are by no means frequent, it may be instructive briefly to detail the *chief* morbid appearances detected in *five fatal cases* of this disease which have come under our own observation. In one, where the patient died in seven days from the period of his first experiencing pain in the bitten part, and in fifty-six hours from the commencement of the hydrophobic symptoms, the following morbid alterations were observed: — *Brain.* — Vessels of the dura mater preternaturally distended with blood, the vessels ramifying in a distinct manner. Pia mater somewhat distended, and a larger quantity of blood interposed between the membranes than usual. Left ventricle with the usual quantity of fluid. The substance of the brain of the usual consistence. When pared off in slices, the surfaces showed numerous brown spots. The vessels of the basis, or cerebellum, were more than usually turgid, and somewhat more of fluid effused than usual. *Pharynx* and *larynx.*—No appearance of inflammation. *Thorax.*—Lungs perfectly sound. Heart flaccid. No coagulum in its cavities; two ounces of fluid within the pericardium. *Œsophagus.*—Upon opening the œsophagus, a substance was found lying closely within the orifice without filling up the cavity. This membrane was nearly the length of the œsophagus; when inflated with the blow-pipe, it assumed a tubular appearance. The abrasion of the internal membrane seemed to extend as far as this substance. The external membrane of a deep red colour. The whole internal surface dotted with purple-like suffusions. *Stomach.*—Contents about one pint, the external membrane of a deep red colour. Its inside covered with broad dark purple-like suffusions, especially about the cardiac orifice. The intestines sound; the liver of the usual healthy character; appearance of bladder natural. The same marks of disease usually exist in most cases of hydrophobia after death, with the exception of the remarkable membrane found in the œsophagus of the one now described, which was considered by all present a portion of the internal membrane of the œsophagus. In *another* instance, on opening the head, the sinuses were found gorged with blood, and the vessels of the arachnoid and pia mater exhibited marks of highly increased vascular action. The lateral ventricles contained a small quantity of serous fluid, and the plexus choroides was of a pale colour. The substance of the brain was softer than natural. The vessels of the spinal arachnoid and pia mater were minutely injected. The lungs and the bronchial mucous membrane were perfectly healthy. The heart and its large vessels were also sound. The lining membrane of the pharynx and œsophagus was somewhat redder than usual. The stomach presented some few slight ecchymoses; the intestines were free from disease. In a *third* case in which the body was carefully examined by a very distinguished anatomical teacher, Mr. Turner, there was considerable vascularity of the pia mater, with slight serous effusion in the lateral ventricles. The substance of the brain was of a firm consistence. Strong adhesions existed between the costal and pulmonary pleura in both cavities of the chest. The lungs were in a state of great congestion, and when cut into, a considerable quantity of bloody fluid flowed from their substance. The membrane of the trachea and the larger bronchial ramifications were here and there marked with dark purple-like suffusions, and had assumed throughout a darker hue than usual. On an inspection of the inside of the fauces, pharynx, and œsophagus, a scarlet uniform redness was observable. The heart was sound. The stomach exhibited evident marks of congestion, if not of inflammation. Numerous small dark-coloured spots appeared about the superior orifice, and might be traced along the larger curvature of the organ. These spots very much resembled the marks of small shot. All the other viscera of the abbomen, with the exception of the liver, which was slightly indurated, afforded no marks of disease. The pia matral tunic of the spine, like that of the brain, was much more vascular than natural. The *fourth* instance was that of a boy, nine years of age, who was bitten by a mad dog about three months previously to the occurrence of the symptoms of the disease. He was under the care of a highly respectable surgeon, Mr. Brownbill, of Salford, to whom we were indebted for an opportunity of attending the inspection. The patient died in sixteen hours after the malady had fairly developed itself. Within the cranium nothing unusual could be detected, except a slight turgescence of the vessels of the pia mater, and rather more distension of the choroid plexus than usual. The fauces, œsophagus, and parts adjacent were in a natural state, but the effects of inflammation were very evident upon the lining membrane of the trachea and the larger bronchial tubes. The lungs were sound, but somewhat distended with blood. The stomach contained a small quantity of brownish fluid, but no diseased appearances were detected in it. The other abdominal viscera exhibited nothing peculiar. The spinal marrow was inspected with much care, but there were no marks of inflammation either in its membranes or substance. In the *fifth* and last case we have witnessed, where death occurred in thirty-four hours after the first unequivocal symptoms of the disease had been present, the following were the appearances on dissection. The brain was in a natural state. The fauces and lower part of the œsophagus afforded slight signs of inflammation; the vessels on the inner coat of the stomach were much more distinctly marked than usual; and a few spots of extravasated blood were observable along the cardiac extremity of the organ. The other abdominal viscera were sound. Nothing unusual presented itself either in the trachea or bronchi. The lungs were somewhat turgid with blood. The spine was free from disease.

All the attention we have been able to pay to the anatomical character of rabies canina leads us to agree with Dr. James Johnson in the following remarks: "That it cannot be denied but that the most evident indications of inflammatory action attend the symptoms, and distinguish the pathology of hydrophobia; that we have often inflammation of the œsophagus, pharynx, and larynx, and occasionally of the brain and spinal cord; yet it is generally admitted that these appearances are more the consequences than the cause of the disorder, and that although frequently present with, they are by no means essential to the existence of hydrophobic action." That they are not *essential* to the existence of the disease is proved by the fact that, in several cases on record, in which the post-mortem examinations have been made by eminent and experienced pathologists, no morbid appearances have been detected in any organ or tissue of the body. Some of the morbid appearances noticed above are no doubt produced by the violence of the convulsive motions which invariably accompany the disease. Lalouette, an able French writer on rabies, has remarked, "L'ouverture de plusieurs cadavres de personnes mortes à la suite de la rage, ne m'a presenté aucun phenomène particulier à cette maladie. On ne trouve nulle part aucun signe de phlogose sanguine, ni d'inflammation. Je n'ai observé nulle part aucun signe de dissolution, aucun engorgement ou phlogose humorale; aucune gangrène interne, ni même aucune apparence de disposition à cette diathèse."

Treatment of Hydrophobia.—The reader will in all probability be prepared, from a perusal of the preceding account of the *pathology* of hydrophobia, to anticipate the conclusion, that in a disease on whose nature anatomical investigation throws such feeble light, the treatment must necessarily be unsettled, and in a great measure conjectural. Dr. Good correctly observed, that the mode of cure in this affection is a field still perfectly open for trial; for, at this moment, we have no specific remedy, nor any plan that can be depended upon, after the disease shows itself. There is, perhaps, no malady to which mankind is liable, that has called forth such a host of remedies for its removal, and alike defied their single and united powers. The long list of the materia medica has been ransacked to discover some one article capable of arresting the progress of this disease, but all have hitherto proved inert. It would be absurd to do more than simply name several of the substances to which ignorance and superstition have attached importance in the treatment of hydrophobia. Amongst these may be classed the celebrated pulvis antilyssus, the theriacas, the alysma-plantago, the rhus coriaria, the scutellaria, the genista, the Ormskirk medicine, and the tonquin powder. Each of the above remedies has had the title of a specific attached to it, and enjoyed for a time unmerited reputation. In the consideration of the treatment of hydrophobia, it appears to us proper to notice, first, the *prophylactic measures* which are indicated; and, next, *the means to be employed after the disease has been once developed.*

It is fortunate that the community at large are now more strongly convinced than formerly of the extreme folly as well as danger of resorting to the use of the several vaunted specifics for the prevention of hydrophobia, and thus delaying application to the well-informed and regularly educated practitioner on the immediate occurrence of the bite. It cannot be too strongly impressed upon the minds of the public, that not a moment is to be lost in soliciting judicious medical aid after the bite of a rabid animal; for, the longer the delay, the greater the danger of the virus entering the system and producing the disease. We shall endeavour to point out the prophylactic plan which seems to afford the surest ground for a proper confidence and security against future mischief. The wound should be well and perseveringly washed from the earliest moment of its infliction. The patient may himself adopt this simple practice until surgical aid be obtained. Dr. Haygarth has suggested that the ablution of the wound may be well effected by directing upon it a continued stream of water from the spout of a tea-kettle, held up at a considerable distance. "If the canine poison," he observes, "infused into a wound were of a peculiar colour, as black, like ink, we should all be aware that plenty of water and patient diligence would effectually wash out the dark dye, but this could not be effected by a slight and superficial ablution." After the bitten part has been well and thoroughly washed, it then becomes a question what further means should be employed to prevent absorption of the virus. Upon this point, it will be found that scarcely any two practitioners are agreed; some giving the preference to *excision*, and others to the *actual* or *potential* cautery. The use of the actual cautery has been chiefly recommended by some of the earlier writers, and is a practice but seldom adopted in the present day, though it is by no means destitute of advantage under particular circumstances. The application of caustics *alone* to the wound has been relied upon by some eminent practitioners. Mr. Youatt, who may perhaps justly be considered the first living authority on canine madness, has warmly advocated the use of the caustic. He recommends the nitrate of silver. Troillet prefers the hydrochlorate of antimony. Earle, in his evidence given before a Committee of the House of Commons in 1830, says that he does not place much reliance on any caustic, except strong nitric acid, for it acts very deeply, whereas "other caustic, for instance, caustic potash, when there is any wound, becomes decomposed by the blood, and does not penetrate to the depth that nitric acid does; and nitric acid forms a dry eschar." Other surgeons, on the contrary, strongly advise the employment of the potassa fusa. Mr. Youatt considers the lunar caustic perfectly manageable, and, when sharpened to a point, as capable of being applied with certainty to every recess and sinuosity of the wound. "The potash and the nitric acid," he observes, "will destroy the substances with which they come in contact, but the combination of the caustic and the animal fibre will be a soft or semi-fluid mass. In this the virus is suspended, and with this it lies upon and remains in intimate contact with the living fibre beneath. Then there is danger of re-inoculation; and it would seem that this fatal process is often accomplished. The eschar formed by the nitrate of silver is hard, dry, and insoluble. If the whole of the wound has been exposed to its action, an insoluble compound of animal fibre and the metallic salt is produced, in which the virus is wrapped up, and from which it cannot be separated. In a short time the dead matter sloughs off, and the virus is thrown off with it." Mr. Youatt informs us that he has been bitten four times by dogs decidedly rabid, and at each time he freely applied the caustic to the wound; and he has remained free from the complaint. He has also operated on more than four hundred persons of whose disease there could be no question, and has not lost a patient. His experience is opposed to the practice of keeping the wound open for several weeks after the application of the caustic, for he supposes, that if a minute portion of the virus should perchance remain in the wound, by applying stimulating ingredients to the part there is considerable risk of exciting the absorbents to action, and producing that disease which would not otherwise have had existence. "Destroy the part at once by the knife or the caustic," he observes, "and then adopt the mildest means speedily to heal the wound." The testimony of Mr. Youatt in favour of caustic is unquestionably very weighty, and entitled to the utmost consideration; but still the fact cannot be concealed, that in the hands of other practitioners, the results of the use of the caustic have not been equally favourable. In the case of Rowley, noticed by Dr. Hamilton, caustic was very carefully applied to the wound by Mr. John Hunter shortly after the infliction of the bite; still the hydrophobic symptoms appeared, and the youth died. It would not be difficult to multiply the cases of failure after a fair trial of the caustic. Mr. Youatt allows that every surgeon must decide for himself respecting the comparative value of caustic and the knife; but he requests that those who prefer the caustic may be no longer exposed to so much gratuitous abuse. He does not condemn the use of the scalpel, but gives a decided preference to the caustic, and only employs the knife in order fairly to get at the wound. It appears, however, from the facts already before the public, that the general experience of the profession is in favour of an *immediate excision* of the bitten part, as affording the best security from danger. Some practitioners have strongly recommended the conjoint use of excision and the caustic.

We shall now briefly give our opinion of the best and most certain means of preventing the disease. It appears to us that *complete excision* of the bitten parts, when at all practicable, ought to be adopted without a moment's unnecessary delay for the trial of caustic or any other external irritant; for it is but seldom that any bad effects ensue from the bite, when this simple operation is carefully and effectually accomplished, and we really consider the medical man who omits this practice guilty of unpardonable neglect towards the unfortunate being who may be doomed, from his want of energy, to writhe under the agonies of this most horrible malady. Indeed the excision of the wounded part should always be employed even in cases where the animal is only supposed to be rabid; for though some degree of momentary pain may be occasioned by the knife, this is of trifling consequence when compared with the mental tranquillity which must result from the conviction of a perfect immunity from the disease by the operation. The force of the above remarks will be felt, when it is considered that canine madness is *incurable*, according to the present state of our knowledge; for we are satisfied, from careful and extensive research on the subject, that when the symptoms of this disease have been once fairly developed, notwithstanding the most vigorous and diligent attempts of medical men to remove them, no cure has ever yet been effected, but the unhappy sufferer has had to struggle with torments such as the imagination cannot conceive, and which must be witnessed in order to be believed. This is a melancholy truth for mankind to know. When excision has been neglected on the first infliction of the wound, still we consider it highly proper that it should be performed at even a distant period from the bite; for it seems to be an established fact that the virus of a rabid animal does not, like other morbid poisons, such as small-pox, cow-pox, syphilis, and plague, always produce its effects within a limited time. Dr. Todd Thomson has expressed his opinion that the hydrophobic virus is not regulated by the usual laws of morbid poisons, and on that account he is inclined to believe that it remains in the bitten part, and the individual is safe till the habit becomes predisposed to the action of the poison, so that the part may be advantageously excised in the intervening time. A case is related by Professor Rust where the wound was excised thirty-one days after the bite, and after the hydrophobic symptoms had appeared, and still the patient's life was saved. When the wound is so situated that the whole of the bitten parts cannot be completely removed, then of course we must trust to the application of caustic, to scarification, or the actual cautery. Under these circumstances it is of the highest importance that the caustic be carefully and effectually used, for the safety of the patient in a great measure depends upon the manner in which this operation is in the first instance performed.

In order to ensure the removal of every part with which the dog's teeth may have come in contact, (for the smallest portion left may produce the disease,) it is necessary accurately to ascertain the depth of the wound, and the direction in which the teeth have penetrated. Unless the excision be carried beyond the bite, the operation fails to afford the patient a security from future danger. The surgeon cannot use too much care in removing the bitten part. We are informed that in one case Mr. Hunter removed the parts, as he thought, freely, and there was nothing on the under surface of the piece cut out that led him to suppose that he had not gone beyond the bite. But on examing the surface of the wound, he found a part in the middle which was hollow underneath, which showed he had not gone deep enough, but had left a ridge as it were over part of the passage made by the dog's teeth, and which could only be discovered by examination after the operation. (*Dr. Hunter*, Transactions of a Medical Society.) Though we have strongly recommended that the wounded part be cut out whenever it can be done with safety, still we see no objection to the application of caustic afterwards to the excised surface, as affording additional security from the greater probability of every particle of the virus being removed or destroyed. With proper deference to the experience of Mr. Youatt, as given above, respecting the impropriety of keeping the wound in a state of suppuration, we must observe that the facts stated on eminent German authority in favour of the practice seem to be incontrovertible. Dr. Wendt states that from the year 1810 to 1824 one hundred and eighty-four persons bitten by dogs were admitted into the Breslau hospital; of whom half were bitten by dogs absolutely mad, or supposed to be mad, and from the whole two only died. It is true, that besides keeping up a copious discharge from the wound for six weeks or longer, mercury was employed internally so as to induce salivation; still by far the greatest stress was placed on the external treatment. It is also mentioned in a very able review of several German essays on hydrophobia, (Ed. Med. and Surg. Journal, 1825,) that at Zurich "the treatment consists of deep scarifications of the wound, the besmearing it with pulvis lyttæ, the application of a blister to the part, the keeping up a discharge from the wound and the blister during six weeks, and the rubbing-in of mercurial ointment till symptoms of approaching salivation come on; internally, belladonna or calomel is given." In the same journal an account is given of the treatment pursued by T. M. Axster, senior surgeon of the large hospital at Vienna; and that of Dr. Hausbrand, district physician at Braimsberg, in cases of bites from animals. During twenty-seven years, Mr. Axster states that not a single old patient was ever brought back to the hospital with hydrophobia. Besides using internally, during three or six successive days, a grain of pulvis lyttæ with six grains of canc. ocul. and sugar, he applied externally over the wound a blister, and dressed it with the pulvis lyttæ or some stimulating lotion during the space of six weeks. Dr. Hausbrand first employed active bleeding in the earliest stage of the disease, then made deep scarifications of the wound, encouraged the flow of blood, washed the wound with salt and water, applied an ointment composed of unguentem basilicum and powdered cantharides, and kept up the suppuration during the space of three months at least. Internally, he directed the patient to take for three evenings a powder with camphor and opium, to drink elder tea, and keep up a copious perspiration. Eleven persons bitten by dogs actually mad, treated in this manner, remained perfectly free from the disease. We have noticed these four prophylactic modes of treatment chiefly with the view of showing the nature and efficacy of the *local* means employed, and the evidence in support of the practice of continuing a discharge from the wound during several weeks. It must be recollected, however, that caution is necessary in drawing a positive conclusion in favour of any particular prophylactic measure, as the disease is by no means a necessary consequence of the bite; for it is a fact founded on the observation of a considerable number of cases, that upon the average not more than one person out of twenty-five who have been certainly exposed to the bite of a mad dog has become infected with the disease.

In noticing the inefficacy of the Ormskirk medicine, pulvis antilyssus, tonquin remedy, &c., Dr. Hunter says the question may be here asked, admitting the frequent failure of these remedies, have they not sometimes prevented the disease? The answer would certainly be in the affirmative if every person bitten by a mad dog who did not use some means of prevention were seized with the disease. But this is not the case; for in the human species the proportion of those bitten who are seized with hydrophobia is much less than of those who escape, even where no means of prevention are employed; we can, therefore, infer nothing in favour of these prophylactics, because they have been given in cases in which no hydrophobia has supervened. (*Hunter*, opus ante cit.)

The application of a tight ligature to the affected part, at a short distance above the laceration, is strenuously recommended by Dr. Good, from the first, even before the process of ablution; and the measure is sanctioned by the authority of Ambrose Paré, Troillet, and other eminent writers. "Analogy," says Dr. Good, "is altogether in favour of this operation, for it is well known to be one of the most important steps we can take in confining the poisonous effects of the rattlesnake and other venomous animals, and of mitigating its violence by the torpor which follows." We have had no experience of the beneficial effect of the ligature after bites from rabid animals, but we see no objection to the adoption of the practice. Cupping-glasses have also been applied to the wound. Celsus even recommended them. (De Medic., lib. v. p. 199.) More recently, the cupping-glass has been strongly advised by Dr. Barry, who has performed a variety of ingenious experiments relative to the absorption of several vegetable, mineral, and reptile poisons. It has been his aim to prove that absorption cannot take place in vacuo, and certainly the results of his experiments seem to us satisfactorily to establish the fact. We conceive that the cupping-glass is likely to prove a highly efficacious remedy in cases of wounds inflicted by poisonous or rabid animals, and we strongly recommend its early and diligent application *after* a careful excision of the injured part; for it by no means supersedes the use of the knife. Mr. Youatt rather objects to the cupping-glass, for he expresses a fear lest the virus, forced from the texture with which it lies in contact by the rush of blood from the substance beneath, may inoculate or become entangled with the parts of the wound; still he thinks that it may be useful after excision of the part, but as connected with the caustic, that it can be of no avail. Amputation has been deemed advisable by some surgeons when the bite has been situated in a part, as in one of the fingers, to which a cupping-glass could not be effectually applied; or when a limb has been bitten in many places, or very deeply in parts not admitting of excision, as through the tarsus or carpus. Mr. Samuel Cooper thinks that under these circumstances immediate amputation might be warrantable *before* the accession of the symptoms. He has noticed a case that occurred at Guy's Hospital some time ago, in which a limb was amputated after the symptoms of hydrophobia had appeared, but without the least check being put to the complaint. "The performance of amputation," this able surgeon justly observes, "previously to the commencement of the symptoms, is a very different practice from that of amputating parts after the symptoms have begun." (Good's Study of Medicine, last edition.)

It may be proper here to allude to the plan proposed by Dr. Marochetti for preventing the development of hydrophobia. He believes that the hydrophobic poison, after remaining a short period in the wound, fixes itself for a certain time under the tongue, at each side of the frænum, where one or two little tumours or vesicles appear, in which may be perceived with a probe a fluctuating liquid. Dr. Marochetti states that the usual time of the appearance of these small knots is within the third and ninth day after the bite, and that if they are not opened within the first twenty-four hours after their formation, the poison is re-absorbed into the system, and all hopes of the patient's recovery are banished. He, therefore, strongly recommends that such persons as have the misfortune to receive a bite from a rabid animal should be examined under the tongue immediately, and that attention should be paid to this part during six weeks; for if these vesicles do not appear in this time, he considers the patient to be perfectly secure from future danger. When, however, they are detected, he directs that they should be instantly opened with a lancet, and then cauterized with a red-hot needle; and that the patient should gargle assiduously with a decoction of broom, and take daily one pound and a-half of the infusion of the tops of the same plant, or four drachms of the powder. Professor Rossi has also published a case in the Annali Universali, in which a cure of hydrophobia is said to have been effected by taking a glassful of vinegar, and the genista lutæ tinctoria internally, and by having the sublingual glands cauterized three successive times. In the examples of hydrophobia which have fallen under our own observation and that of some other practitioners, the knots or vesicles under the tongue, described by Dr. Marochetti, have been looked for in vain; and, indeed, their supposed presence seems to be a mere anatomical delusion. It may be correctly said that Marochetti's statements have not been confirmed by the general experience of the profession, so that practitioners may be undeceived in any expectations of security they might be induced to form from adopting his process to the neglect of the means noticed above; for the results of such misplaced confidence would be irremediable. We venture to repeat our conviction of the imperative necessity, in every case of injury from a rabid animal, of deeply and effectually cutting out the bitten part when it can be done with perfect safety, and of the propriety of keeping up a free discharge from the wound for several weeks by the aid of some active external irritant; and that when the operation of excision is inadmissible, recourse must be had to scarification, lunar caustic, or the actual cautery.

Amongst the chief preservative means that have been employed *internally* in conjunction with the local plan of cure, we may merely mention belladonna, cantharides, mercurials, emetics, volatile alkali, broom decoction, and chlorine: for it would be a waste of the reader's time to present him with a detailed examination of the individual efficacy of these several remedies as preventives of the fatal consequences of the bites of rabid animals, since the most ample experience has proved them to be altogether unavailing, and therefore undeserving of future confidence. To the vaunted specifics before named no further allusion is necessary.

Having thus considered the *prophylactic measures* which are indicated, we may next notice *the means to be employed after the disease has been once developed.*

This part of our inquiry is attended with some degree of difficulty, because no successful method of cure has as yet been discovered, after the characteristic symptoms of hydrophobia have once appeared. "There is, indeed, no disease," as Dr. Good justly remarks, "for which so many remedies have been devised, and none in which the mortifying character of vanity of vanities has been so strikingly written on all of them. In the loose and heterogeneous manner in which they have descended to us, they seem, indeed, to have followed one another without rational aim or intention of any kind." The whole subject of treatment is difficult and afflictive. We scarcely know how to reply to the important question,—What plan of cure is a practitioner to adopt when he meets with a case of rabies? but it is necessary to attempt an explanation of the mode of treatment which, on the whole, seems to be the most suitable for adoption.

The limits of this article would be extended to a very unnecessary length, were we to do much more than enumerate the various remedies that have been tried in this disease; but a brief notice of them is required, for without a knowledge of what has been attempted, much time must be lost in useless trials and fruitless repetitions.

Amongst the various articles in the materia medica which have been employed for the relief or cure of hydrophobia, *opium* is entitled to be first mentioned. This drug, in various forms and in very large quantities, has had the most full and ample trial; but experience has too often proved its inefficacy in this disease. Dr. Vaughan exhibited fifty-seven grains of opium in the course of fourteen hours with little or no effect upon the symptoms; and in one case Dr. Babington administered one hundred and eighty grains in eleven hours, without any benefit, and without even procuring sleep. (Medical Records and Researches.) In another instance Dr. Marcet gave opium, iron, and arsenic, to a great extent, but with a like unsuccessful result. Magendie introduced opium in large quantities into the veins of rabid dogs, but without producing its ordinary narcotic effect; and Dupuytren and he afterwards injected eight grains of the extract of opium, in solution, into the crural vein of a young man labouring under hydrophobia in its severest form; but the experiment only afforded temporary relief, for he expired on the fifth day from the attack of the disease. Dr. Richard Pearson strongly recommends the injection of warm water in very small quantities, and impregnated with narcotic substances, into the veins of hydrophobic patients, for the purpose of subduing the spasms which prevent deglutition. This object being attained, he proposes the administration of a strong cathartic, copious dilution with mucilaginous liquids, camphor, and other antispasmodics; and after the operation of these medicines, sponging the body with cold water and vinegar, and giving at the same time internally the nitric or muriatic acids, and lastly some of the vegetable tonics. Dr. Booth considers the acetate of morphia as far preferable to opium for injection into the veins of the hydrophobic sufferer, as its dose and powers are more definite than those of the latter drug. In conducting the injecting process, he suggests that twenty-four minims of the solution of acetate of morphia (equal to four grains of opium) mixed with two drachms of distilled water, be introduced into the cephalic vein; and then, after waiting for about ten minutes to observe the effect, that the operation be repeated at like intervals until a decided sedative impression be produced. (Booth on Hydrophobia.) Dr. Brandreth made trial of injection of the acetate of morphia, as recommended by Dr. Booth, in a well-marked instance of hydrophobia, and found that it mitigated the sufferings of the patient in a most decisive manner. In a case of more recent occurrence, we have ourselves witnessed the injection of the acetate of morphia, but we regret to say that it altogether failed in diminishing the violence of the symptoms, and retarding the fatal progress of the malady. The operation was skilfully performed by a very respectable surgeon, Mr. Barton, in the presence of Dr. Hull, Mr. Fernely, Mr. Boutflower, Jr., and other medical gentlemen. Dr. Ward has strongly advised opiate frictions in hydrophobia; and in more than one instance they have succeeded in calming the irritability of the system, and obtaining a temporary abatement of the distressing spasms of the muscles of respiration and deglutition. Upon the whole, it may be correctly asserted that opium possesses some claims to future confidence as an antilyssic remedy. *Mercury* is another substance which has been highly lauded for its efficacy both in preventing the disease, and removing it after it has actually appeared. It has been very freely employed internally and by friction, on the authority of Dessault, Kaltschmid, James, du Choisel, Andry, Selig, Königsdörfer, Walther, and other writers; but unfortunately (as an able reviewer justly observes) there are too many cases on record of persons in whom the external wound has been improperly managed, dying of this complaint, notwithstanding the exhibition of large doses of mercury, to warrant much reliance on this remedy alone. (Edinburgh Medical and Surgical Journal, vol. xxi.) *Belladonna* has also enjoyed the reputation of a valuable remedy in hydrophobia; but the success which seems to have attended the administration of this drug in the practice of Brera and Massahen, has not been present in a number of cases observed by different physicians. *Acids* (particularly the oxymuriatic and acetous) have been freely used and warmly recommended by Aselli, Previtali, and Brugnatelli; but their inefficacy has been proved in several instances. In the case of a young man named Brassendale, which came under the notice of Dr. Bardsley, the aqueous solution of chlorine was fairly tried, but with an unsatisfactory result. *Alkalies, cantharides, antispasmodics,* as campnor, assafœtida, musk, and castor; *diuretics, oil,* internally, and by friction; *arsenic, prussic acid, stramonium, white hellebore, acetate of lead,* and the *warm bath,* have also been used, but with no better effect.

Venesection has long been considered a powerful remedy in hydrophobia, and has been frequently employed to a very great degree. It has been chiefly advised by those authors who believed in the inflammatory nature of the disease. Mead, Nugent, Fothergill, Shadwell, Ferriar, Hartley, Innes, and more recently Tymon and Schoolbred have been the warmest advocates of an early and vigorous use of the lancet; and several cases have been quoted, on the authority of some of these writers, in proof of the efficacy of the practice. Having carefully perused these histories, we feel a difficulty in admitting that the patients were really rabid. Rutherford, Parry, and Troillet have employed profuse and repeated depletions, sometimes even to deliquium, but without any curative result. Indeed, the evidence of Troillet on this point may be deemed conclusive. "Gueyette," he relates, "a été saigné trois fois jusqu'a defaillance, et malgré la perte de sept livres de sang, la rage a continué sa marche funeste. Une terminaison si contraire à celle que nous avions lieu d'attendre nous a fait jeter un regard plus attentif sur l'observation du Doctor Schoolbred; elle n'a pu soutenir l'épreuve de l'analyse; et nous sommes convaincu que son auteur s'est laissé égarer, comme Nugent, par quelques symptomes, qu'une erreur trop commune a fait attribuer exclusivement à la rage. La saignée à défaillance, que des médecins célèbres avoient déjà conseillée, sera abandonée de nouveau." (Traité de la Rage, p. 367.) It appears also from the experiments of MM. Magondie, Dupuytren, and Breschet on rabid dogs, that profuse venesection was of no avail in arresting the disease.

The *cold affusion* has been attended with palliative effects. In the case of Nixon, who was admitted into the Manchester Royal Infirmary, the patient experienced much relief from having cold water dashed upon his body. He not merely stated how grateful the practice was to him in removing the burning heat of skin and other distressing symptoms, but even solicited its occasional repetition. *Electricity* and *galvanism* have also produced a diminution of suffering in more than one example of hydrophobia. In less than half an hour from the period of the electrical machine being put in motion, Dr. Bardsley's patient, Warren, became more calm and tractable, and expressed a desire to drink some water, which he was able to perform with comparative ease and readiness, and with no small marks of pleasure and even triumph. (Medical and Physical Journal, vol. xiii. p. 159.) [Dr. Mease (*Amer. Med. Intelligencer*, Sept. 1, 1840,) has strongly urged the application of a solution of potassa so as to inflame the surface along the spine, as advised by Dr. Hartshorne in tetanus.] *Tobacco* has occasionally been prescribed, and with apparent benefit. The fumes of the plant have been introduced into the rectum; an infusion of the leaves has been employed in the form of enema; and it has been applied externally as a cataplasm to the scrobiculus cordis. Though this drug has failed in preventing the fatal termination of the disease, still it has been shown to have the power of controlling the violence of the spasmodic actions of the tible of the influence of the given irritant applied in a certain dose.

Diversity of property, whether of organic or inorganic structures, is the great beauty of creation, and constitutes the essence of individual natures, or that character by which they are distinguished from every other thing, and are thus solely the things they are. It is the principal medium through which its divine architect conserves the actions of the machine, which, in this sense, become just so many fulfilments of his original purpose. Such effects of external upon susceptible bodies differ in little from the action of an acid upon an alkali, being equally the result of special properties previously impressed upon each; and are facts not to be explained but observed. The blood of an animal imbued with the canine poison may have its power of irritation exactly in that degree of modification which produces most vehement effects upon the nerves of voluntary motion, and upon the distributions and connections of the eighth pair; and yet not to be in a state capable of effecting the least impression upon the liver, spleen, kidneys, or uterus: and, on the other hand, the motor and pneumogastric series of the nervous system may be originally endowed with exactly such a degree of susceptibility as enables them to originate those high indications of excitement which they exhibit in hydrophobia, with frequent febrile re-action whenever the virus is applied to them through the medium of the blood. The peculiar effects of every individual virus hitherto discovered, prove that this mutual coaptation of the stimulus and sentient fibre to each other is not merely a vague supposition of what may be, but an actual induction supported by the analogy of every known example of inoculated virus. We repeat then, that this notion of the hydrophobic poison producing great nervous irritation and fever, from which all the other phenomena naturally result, is far from being wild and fanciful; and, independently of the names of its distinguished authors, merits due consideration. It has the advantage of embracing nearly all the phenomena, as it is not necessary that the fever should appear on any particular day, or appear at all, just as we see obtain in tetanus and hooping-cough; neither when it does come, does there seem much excuse for so keen a verbal critic as Dr. Rush terming it *malignant*. The vomiting, gastric pain, appearances on dissection, as well as the peculiar character of the matter ejected, the thirst and spasmodic irritation of the throat, and the necessity of some portion of the acrid saliva being received into the stomach, are circumstances which have induced many distinguished men to believe that the virus first exerts its malignant influence upon the stomach, and from this, as a centre, radiates its action to the most distant points of the system which have any consent with the stomach, by that sympathetic irritation which we see prevailing in so many gastric diseases. This view is also ingenious, and comprehends a great many of the phenomena of hydrophobia; but it appears liable to some fatal objections; it does not explain the total absence of gastric symptoms in many individuals, and of traces of disease in the tunics of the stomach in many others; and there is frequently no rejection of solid food by hydrophobic patients, or of solids and fluids by dogs, as happens in gastritis, and might be expected to take place if the stomach was in any way the primary seat of hydrophobic irritation. The affection of the respiratory organs also, seems quite too violent to be an effect of mere gastric irritation.

Still less tenable was the ancient hypothesis, that the virus of the mad dog first acted upon the liver, producing a large secretion of black bile: that this black bile accumulating, frequently gave rise to the symptoms of melancholy and hypochondriasis, diseases which were then supposed to be produced by that fluid: that the black bile then made its way into the stomach and excited hydrophobia, very much in the same way we have just sketched. There is no black bile, and the occasional appearance of bile in the stomach is the effect of the vomiting, not the cause. The same series of objections apply to the opinion which refers the principal focus of hydrophobic action to simple inflammation of the pharynx and larynx, or of the two former, or of the latter alone; in all these situations the marks of inflammation are often entirely absent. The sensibility of the fauces, the copiousness of the salivary secretion, the thirst and suffocating spasm, bear no proportion whatever to the presence, absence, or degree of these traces of inflammation which scarcely ever appear at the commencement of the disease, and are therefore consecutive of some other and later part of it. Besides, the general sympathies of the fauces are not very extensive, and they are so ordinarily the seat of inflammation that it would not be rash to assert that no one case out of a million exhibits a regular specimen of hydrophobia, even in its non-rabid form; while scarcely one case in a hundred is without a regular display of them in the rabid form. This consideration mightily reduces the number of chances in favour of the phlegmasian hypothesis, which counts many able supporters.

Authors have conjectured that the initial seat of the virus might probably be somewhere in the respiratory apparatus, in the larynx, bronchi, lungs, diaphragm, thoracic muscles, or all of them together. This conception has certainly the advantage of coinciding with appearances at a very early stage of the disease, in which frequent sighing, a panting motion of the chest, uneasy respiration, an occasional sense of suffocation and fainting, are generally experienced: it has the further advantage of explaining what takes place in the pharynx, gullet, and stomach, much better than the assuming these symptoms to be primary; and elucidates the perverted state of respiration considered as their consequence. But the theory affords no rational explanation of the fever, the mental aberration, the salivation, the tremours, the spasms; and these objections seem fatal; for no theory of a disease can be admitted which leaves as much as it illustrates unexplained. We have said enough when we mention M. Dessault's theory of organic worms; of which the day is long past.

It seems hardly necessary to observe, that those ancient authors of the Alexandrian school, who ascribed the seat of the disease to the brain and its membranes, merely did so because they considered these organs as the primary origins of the nerves; the nerves of sense being conceived to proceed from the mass of the brain and spinal marrow, while the nerves of motion were believed to spring, by small roots, from the membranes that invest them. This is also the comment of Aurelianus, and we are warranted therefore in affirming that their theory of hydrophobia differed not essentially from that of Mead and Rush, and does not therefore require to be considered apart; since, like these authors, almost all the ancients admitted the absorption of a virus. Themison, Aurelianus, and others of the methodic sect, conceived that the virus inflamed and dried up the blood, thereby producing a deficiency of secretion in the fauces and gullet, great thirst, and a general constricted state of the system. In short, it was a well-marked example of the *strictum*, and accordingly directed all their efforts to subdue this state of rigidity by introducing fluids into the colon, plunging the patients into water, and other contrivances. M. Magendie's method of injecting tepid water into the veins might be expected to answer the same purpose; but it is impossible to prove the existence of constriction in hydrophobia; thirst is not always present; and the whole theory has been long since exploded, as incompatible with the doctrine of the circulation and with the general principles of pathology.

Of late years, since the experiments of Legallois, Wilson Philip, and Magendie, [and Dr. Marshall Hall], respecting the structure, function, and relations of the spinal cord have become so justly celebrated, Dr. Reid of Dublin, and several continental writers, have endeavoured to revive a part of the above ancient theory, and to replace the principal seat of hydrophobia in the spinal marrow. Some slight dilatation in the vessels of this part, and vestiges of inflammation noted in one or two dissections, seem to be the only new facts upon which, in connection with the light thrown upon the spinal portion of the nervous system by those experimentalists, this idea is at present supported. But it leaves the mental phenomena, the salivation, the spasms of the face, the tenderness and unnatural appearance of the skin, the gastric, and particularly the diaphragmatic irritation, altogether unexplained; for it is scarcely necessary to observe that the nerves of the stomach and diaphragm originate much above the points where such congestions are observed; and which, though they be often totally absent, are not therefore to be totally denied, since both men and animals (Gillman's pigs for example) often exhibit a distinct paraplegia some time before death. It is not improbable that the paraplegia here alluded to in man is that which has given rise to the numerous fables of the older authors, of hydrophobic patients rolling themselves up like a ball, crawling on all-fours, and attempting to lap water in the horizontal posture, like a dog, &c. "In a state of despondency," says Dr. White, of Bury St. Edmunds, "and with agonizing groans, the patient threw himself down, as we thought, in a corner of the room, and soon after crawled about in a restless manner, dragging his legs after him, which proved to us that he fell on the floor from his lower limbs being palsied."

Amidst so many ingenious hypotheses, if we are finally asked which of the number appears to us to be on the whole the most consonant to reason, we at present say that an explanation of the phenomena which does little violence to the recognised principles of pathology may most easily be drawn from the first, which assumes that the imbibed virus, like most other poisons, mainly and initiatively spends its force upon the nervous system. It is a well-known fact that all severe injuries inflicted upon this system, whether in the way of stimulus or depression, manifest the gravity of their influence most remarkably in that series of organs supplied by the eighth pair: and conversely, experimentalists, as M. Desmoulins, have found that the smallest pressure even of a drop of blood upon the origin of this nerve in animals almost instantly extinguishes life. The affection, then, so strongly marked, of the parts supplied by this nerve in hydrophobia, and the curious circumstance of its never extending its ravages below its pneumo-gastric termination, may perhaps be considered merely as an index of the deadly virulence of the cause. Still we have shown above that there is no difficulty in comprehending, with the ancient Gaius, that the poison of rabies exerts a peculiar inveteracy of action upon the origin of the respiratory column and the commencement of the eighth pair, just as the vomiting, dysphagia, and laborious respiration, occurring from a violent blow on the head, may either be assumed as the known ultimate effect of general compression, or as a modification of these by some special injury at the same time inflicted on the origin of the same pair.

Diagnosis.—Properly speaking, there is scarcely any disease that a careful practitioner would confound with hydrophobia; but in cases where no rabid impregnation is suspected, the disease may be mistaken for phrenitis, mania, fever, or tetanus; and, in the incipient stages, for melancholy, hypochondriasis, and hysteria. It can only be mistaken for any one of the three latter during a few hours from the commencement. Hysteria and hypochondriasis advance by slow degrees, and rarely have fever, difficulty of respiration, tenderness of skin, or salivation. Melancholy is altogether a chronic disease, and never has convulsions, spasms of the throat, dread of water, difficult respiration, and vomiting among its symptoms. It is true that phrenitis, and what was long classed as a form of it, delirium tremens, have tremours, suspicious fears, tenderness of skin, convulsions and difficult swallowing; but there is no affection of the stomach or respiratory system, no vomiting, no salivation: nay, spasmodic difficulty of swallowing occurs not in one case out of a hundred. From mania it is distinguished as soon as the spasms, difficulty of swallowing, and salivation appear. Indeed the mental aberration, the aversion to certain objects, and the fever which is occasionally present in both, seem to be almost the only points of resemblance. Dr. Rush has entered into a long argument in order to evince the identity of fever and hydrophobia; but though hydrophobia has fever, it does not follow that hydrophobia is the same thing as fever; or, in other words, is fever alone. In short, we have often repeated that in many cases of hydrophobia fever actually supervenes; and that where it does occur, it is seldom a primary symptom. The distinction of hydrophobia from tetanus has been cause of which is not very readily ascertainable. In a tray painter, whom we examined a few years ago, these paroxysms came on every morning between two and three o'clock, and lasted for an hour or more. He was compelled by the sense of suffocation to start out of bed, and while the attack lasted he placed himself against an open window, gasping in the most terrific manner for air. We saw him only three days before his death, which took place suddenly, and on examination the lungs were found to be œdematous; upwards of two quarts of serum were contained in the cavities of the pleuræ, and a few ounces of coffee-coloured fluid in the pericardium. The only other morbid appearance in the whole body was hypertrophy of the left ventricle. While the symptoms now referred to continue to increase, the face likewise becomes more and more œdematous; the cheeks assume a purple hue, and the lips become livid and at times almost black. The duration of this state varies considerably in different individuals, sometimes lasting for weeks without any alleviation of symptoms, sometimes admitting of great relief by medicine, and intervals of almost perfect ease; at other times its progress is extremely rapid, a few days only intervening between the first symptom of effusion and dissolution. The termination is in many cases very sudden, and in fat individuals sometimes a very slight effort is sufficient to break the thread of life. It is no unusual circumstance for such persons to die while in a privy, apparently in the act of evacuating the bowels, the slight straining which they are then compelled to make being more than the system is able to bear.

In the symptoms which we have now enumerated, we have endeavoured as much as possible to confine ourselves to those which may fairly be regarded as the consequence of effusion. They are, however, in general so much complicated with the symptoms of the original disease, that probably, notwithstanding these precautions, we may have been led into error. It must, however, be remembered that the original disease during this time is not stationary. Valvular concretions may continue to increase; aneurisms become more and more dilated; or whatever other organic change the heart may be the subject of, be proceeding, independently of effusion, to a state inconsistent with health and life. Accordingly, the symptoms of these changes are aggravated at the same time: the palpitations become more frequent and more severe; frightful dreams, sudden starting from sleep, &c. &c. more and more marked; and the vital powers are manifestly daily yielding. It ought not to be forgotten that these two diseases thus acting upon each other, may give rise to such a congestion in the lungs as will be best relieved by bleeding. Much caution and attention, however, ought to be paid to the state of the patient before we conclude that this is the case, since if bleeding be unnecessarily resorted to, it will unquestionably debilitate the patient and hasten his dissolution.

What we have now said refers to hydrothorax as dependent upon disease of the heart; it sometimes, however, succeeds to bronchitis and pneumonia; and in this case the progress is somewhat different. The palpitations and other cardiac symptoms are usually wanting, and there is nothing more manifested than increased dyspnœa. Previously to this becoming very marked, however, the face and feet swell as in the former instance; the patient then requires the head and shoulders to be raised, and at length, as in the former case, he is unable to lie down at all, but remains constantly in a sitting posture. In these cases the termination is seldom so sudden as when the heart is diseased, neither does the countenance exhibit in the same degree the purple and livid appearance. This, however, may be owing to the fact, that the effusion is seldom so great when the consequence of disease of the lungs, as when attended by cardiac disease; and it seldom occurs till the original disease has so far weakened the system as of itself to threaten a speedy termination.

In addition to the symptoms and history now given, we have yet farther means of diagnosis in succussion, percussion, stethoscopic auscultation, and admeasurement.

Succussion, as has been already explained under the article Auscultation, consists in forcibly shaking the patient's body and observing the sound thereby produced; and, at the same time, to produce any appreciable sound, it requires the presence of both a gaseous and a liquid fluid in the chest. In hydrothorax it can only be serviceable when the cavity of the pleura communicates with the external air through an aperture of the lungs, or when gas is evolved within the same cavity without any such aperture. We are not, however, aware that either of these circumstances has been ever noticed in the real hydrothorax, although the former is common enough in empyema arising from the bursting of a pulmonary abscess into the cavity of the pleura.

Percussion returns a dull and flat sound over every part of the chest where there is effusion, and the extent of the effusion may be partly judged of by the extent of surface which affords the dull sound. There are, however, many other diseases of the chest besides hydrothorax which prevent percussion from affording the healthy degree of resonance, and to distinguish hydrothorax from these we must be indebted to other means, and among these the stethoscope is one of the most valuable.

The stethoscope, if employed very early, and while yet the effused fluid is in very small quantity, affords that peculiar sound of the voice which Laennec has termed ægophony. This, however, will very rarely happen, for usually the effusion is considerable before application is made for assistance. The only information which the stethoscope affords under these circumstances, is a want of respiration everywhere excepting at the root of the lungs.

When, however, we have thus learned from percussion and stethoscopic auscultation that the lungs are impeded in their functions, we have yet to learn what the change is which thus prevents the ingress of air, whether the impediment arises from condensation of their substance, whether from empyema or real hydrothorax, or from any other cause, such as aneurisms, tumours, &c., compressing their substance. In order to arrive at this information, we must estimate the general symptoms and those afforded by percussion and stethoscopic auscultation together.

In the article Empyema, the principal affections have been enumerated which might be confounded with that disease, as tubercular consumption, hepatization of the lungs, tumours in the cavities of the pleuræ, &c.; and for the most part the same means of distinction exist between these affections and hydrothorax. It still remains to be shown what means are afforded us of distinguishing empyema from hydrothorax, and this can only be done by an accurate investigation of the preceding symptoms.

In hydrothorax the serous diathesis always prevails, and there is, at the same time with effusion into the cavities, effusion in the cellular tissue either of the face and ankles only, or of the extremities, sometimes of the whole surface of the body. Now, even in empyema we may also have anasarca partial or general, but upon inquiry we shall in this case find that the symptoms of the chest have long preceded the appearance of dropsy, and the latter, instead of appearing the direct consequence of the thoracic disease, would rather appear to be the mere result of debility; — the cough, the dyspnœa, the emaciation especially, having usually proceeded to an extreme before there was the slightest appearance of effusion. In hydrothorax, on the contrary, the appearance of œdema of the face and ankles long precedes the more severe affection of the chest: sometimes even the ankles attract attention for a little while by swelling, and then subside for a considerable interval, or they swell so slightly as to be forgotten. In empyema, again, the stethoscope will usually prove that respiration is well carried on in one lung at least, although the other may be perfectly useless. This, however, can seldom happen in hydrothorax; and were we to judge from our own observation, we should even be inclined to say that it never happens. Whenever hydrothorax exists to any extent, that is, whenever there is any considerable quantity of serum in the cavities of the pleuræ, the lungs participate in the dropsical disposition, and fluid is effused into their cellular texture. This must, therefore, materially impede respiration, and as it must exist nearly equally in both lungs, there can never be the decided difference between the two sides that is observable in empyema.

Perhaps we ought not to omit all mention of *admeasurement*, more especially as effusion, real dropsical effusion, may exist to a much greater degree in one side than in the other. That side in which the effusion is greatest will certainly be more dilated than the other, as is the case in empyema; but if with this difference of measure we unite the indications of the stethoscope, we cannot be in much danger of confounding the two affections.

Bichat has recommended an experiment in doubtful cases of hydrothorax which deserves some notice, especially in distinguishing it from empyema. This consists in placing the patient in an horizontal position, and pressing upon the abdomen from below upwards, thus limiting the descent of the diaphragm. The fluid effused into the pleuræ is thus forced to compress the lungs, the sense of suffocation becomes most painful, and the countenance assumes a livid hue. Now as distinguishing hydrothorax from any diseases occupying both sides of the chest, this appears scarcely available; but in distinguishing it from empyema, which occupies only one side, it may be a most valuable resource. Dr. Townsend, in the admirable paper upon empyema, to which we have before referred, remarks that if the pressure be made on that side in which effusion is present, no result follows, because this side being already useless, no additional pressure can add to the inconvenience; but if it be made on the sound side, this being the only side which is useful for respiration, the expansion of the lung is prevented, and the utmost distress induced. In distinguishing hydrothorax, then, from empyema, much use may be made of this experiment, although it by no means answers in the manner which its celebrated author proposed.

Prognosis. — The prognosis of hydrothorax is always unfavourable, because it is never a simple disease, but always the consequence of some other malady, which would, even without effusion, eventually terminate in death. This opinion, however, is only applicable to a complete restoration to health, for to a comfortable state it is frequently in the power of medicine to restore the patient. So far as the mere effusion is concerned, it may in many cases be removed again and again; and as this is often the most threatening source of danger, the prognosis may for a time be reversed. Still every fresh occurrence of dropsy of the chest makes even a temporary recovery less probable, and in giving any opinion of the disease we must take into our consideration both the stage of the original disease, and the frequency with which effusion may have occurred. Under all circumstances our opinion ought to be most guarded, and it is at least wise never to omit the announcement that death may be sudden.

Appearances on Dissection. — If we were to enumerate all of those which are at different times found in hydrothorax, we could scarcely omit any long exhausting disease of the human body, certainly none of the thoracic viscera. This would, however, be proceeding much farther than would be useful. Some diseases, however, are much more liable to terminate in hydrothorax than others, and such are those in particular of which the heart, the great blood-vessels, and the lungs, are the subjects. Accordingly, valvular disease of the heart, active and passive aneurisms of the same organ, aneurisms of the aorta and arteria innominata, chronic bronchitis, and tubercular consumption, are more frequently met with than any other organic changes in hydrothorax. Some changes are also observable in the state of the pleura, but this is only very manifest when actual inflammation has been present. We have seen a vascular state of this membrane, and various degrees of factitious membrane deposited upon it.

The quantity of fluid varies very considerably, and in our experience it has always been greate. when dependent upon disease of the heart and great blood-vessels than on any other cause. M. Itard places the largest quantity at twelve or fourteen pints, and Portal quotes a case from Wolfius in which sixteen pints were found. Morgagni seldom mentions the precise quantity, but usually states it at some pounds. With one exception, the largest quantity we have met with did not exceed nine pints. In the excepted case, which was an aneurism of the arteria innominata, the quantity effused must have been at least fourteen or fifteen pints.

The colour of the effused fluid is usually amber, sometimes, however, mixed with coagulable lymph, but this only happens when there has been inflammation of the pleura. Laennec has indeed very justly observed that from the appearance of the effused fluid alone it is not always easy to decide whether the affection has been hydrothorax or empyema, the serum assuming many grades between a limpid fluid and coagulable lymph. This fact is of great importance in practice, as Dr. Forbes has remarked: it is essential that the physician remember that the inflammatory and serous diathesis may exist together, or supervene one to the other. The plan of treatment must therefore be varied accordingly.

Like the effusion into the other cavities of the trunk, the fluid is sometimes of a dark coffee colour, sometimes bloody, and assumes every variety of hue between the pellucid serum and blood itself.

Treatment.—The same general principles apply to the treatment of hydrothorax which have been mentioned under the article Dropsy. Although the original cause of effusion is an affection of some organ of the chest, or some disorder of the general system, yet the immediate source is the serous membrane, and regard must be had to its condition. Even in a very weakened state of the body the pleura may become inflamed and demand an antiphlogistic treatment. When this is the case, it is an important object of inquiry how far antiphlogistic remedies may be carried with advantage or even with impunity; and upon this point some few considerations present themselves to our notice.

When towards the termination of chronic diseases local inflammation occurs, we have a very different physiological state of the system to contend with from that which would be present should such inflammations take place from an immediately previous good state of health: not only under these circumstances have we no general plethora to overcome, which indeed might happen when the system had not been weakened by disease, but there is a positive wasting and probably actual inanition. Now even in common circumstances it is never advisable to carry bloodletting farther than is sufficient to overcome the immediate inflammation, for although no evil result may be at once apparent, no one can have followed the footsteps of some modern bleeders without seeing the most deplorable consequences of over-depletion. Months and even years are often necessary to restore the system to that equilibrium in which the mens sana in corpore sano can again be enjoyed. We have no hesitation in asserting that many of the most lamentable cases of hysteria and habitual nervousness owe their origin to this miscalled heroic practice, and in females particularly that helpless capriciousness, which is so often burthensome to themselves and tormenting to their friends, has been derived from repeated bleedings for pains in the side, which have upon very slight investigation been referred to the presence of acute pleurisy. If then this happen with persons in health when bled improperly, the consequences of unnecessarily large bleedings in chronic diseases are still more disastrous. In the latter stages of tubercular consumption we have seen patients hurried to their graves by wild attempts to cure a pleurisy, without any consideration of their previous state, and even in pneumonia fatal effusion has instantly followed a large bleeding, when perhaps a moderate one would have restored the individual to health. In the treatment of hydrothorax dependent upon an exhausting organic disease, an error in this respect would be almost certainly fatal, for we well know that hemorrhage, even without previous debility, is one cause at least of dropsical effusions.

By what we have now said, however, we by no means intend to proscribe bleeding in water in the chest, but merely to urge that due caution be practised in employing it. Two circumstances may occur in hydrothorax which may render bloodletting necessary, the occurrence of pleurisy acute or sub-acute, and congestion in the lungs: the latter is particularly liable to happen when hydrothorax is connected with valvular disease of the heart. In the former case local bleeding is always preferable, both because it may be taken much more immediately from the seat of disease, and also because it has less effect upon the general strength of the system. Another advantage is derivable also from cupping, which neither general bleeding nor leeches are calculated to afford, and this is a more permanent determination of blood to the external surface from the action of the cupping-glasses. That cupping has a decided advantage over leeches need hardly be mentioned. In our opinion the latter never ought to be used when the former can be employed. Both the quantity of blood taken is more satisfactorily ascertained, and the patient is not fatigued or inconvenienced in any degree equal to what is the consequence of employing leeches.

When it is necessary to draw blood on account of congestion in the lungs, recourse must be had to general bloodletting, and the quantity must be guided by the effect upon the disease. We know of no very certain sign that this congestion has place when hydrothorax is present, excepting the occurrence of hemoptysis; and wherever this happens with valvular disease of the heart, we should not hesitate to bleed, and it will usually be found advisable to repeat the bleeding at longer or shorter intervals. In general it will be necessary to take only a small quantity of blood at a time, sometimes not exceeding six or eight ounces; but the benefit afforded by this is very decided, and the debility induced is not enough to prevent recourse being again and again had to venesection for relief.

Purgatives and diuretics naturally suggest themselves as the medicines most likely to afford relief in hydrothorax, and to each belong advantages which are not possessed by the other. The relief afforded by elaterium and croton oil is unquestionably much more speedy than that which can be obtained by the employment of diuretics. Unfortunately, however, they exhaust the patient in a much greater degree, and cannot be safely employed in a very debilitated condition of the system. The mode of giving elaterium has been mentioned under the articles anasarca and dropsy, and we have nothing to add to the observations there made. We may make a similar remark regarding digitalis and other diuretics. Here we will do no more than repeat what we have frequently said already, that the dropsy is only symptomatic, and that it is to the cure of the original affection that we must look for the perfect restoration of the patient; and our success in practice will mainly depend upon the accuracy of our diagnosis as to the original cause of the effusion.

The last point to which we shall allude in the treatment of hydrothorax is the propriety of tapping, an operation which we can scarcely conceive applicable to genuine hydrothorax. Most of the cases in which paracentesis thoracis has been employed, were in fact cases of empyema; and unquestionably there are many instances on record in which complete success was obtained by its performance. In the article hydrothorax, in Good's Study of Medicine, we have but another instance in addition to those referred to by Dr. Forbes, of practitioners confounding empyema and hydrothorax together. He has mentioned a successful case by Dr. Arthur of Dublin, which, without doubt, was an instance of empyema, as it had been the result of a preceding pleurisy. But empyema is usually confined to one side of the chest, the opposite lung being comparatively healthy; and hence, by drawing off the fluid, we have some chance of the compressed lung recovering itself, and we at least take off any inconvenience which may arise from the quantity of fluid narrowing the cavity of the sound pleura. In hydrothorax, on the other hand, both sides are affected, though perhaps not in an equal degree; and whenever the effusion is sufficiently great to suggest such an operation, there is the greatest probability that the cellular texture of the lungs themselves is likewise the seat of effusion. Hence it must be always doubtful to which the dyspnœa ought to be referred, effusion within the cavities of the pleuræ, or effusion within the cellular tissue of the lungs; and at the best, the usefulness of the operation must be very problematical. It is not, however, very likely, that in real hydrothorax it will ever be proposed. [For the best mode of performing the operation, see the article EMPYEMA.]

JOHN DARWALL.

[**HYPERÆMIA.** (See CONGESTION.)]

[**HYPERÆSTHESIA**, *Supersensitiveness;* from ὑπὲρ, over, and *αἰσθησις*, "sensibility." Augmentation of sensibility. This may affect the several senses; as in nyctalopia, hyperacusis, hyperosphresia, hypergeusia, hyperaphia, &c. A highly exalted state of sensibility is occasionally seen, in which the sufferer is so impressible or nervous—as it is usually termed—that he cannot bear the slightest unusual impression on any of the senses without fainting, and without the minutest changes of atmospheric density and temperature producing disagreeable sensations.

This great nervous impressibility may be caused in various ways. It supervenes, at times, on long protracted and profound mental exertion, on want of sleep, great fatigue, and any thing that exhausts the nervous system; but it more frequently follows profuse evacuations of every kind,—too copious bloodletting, or hypercatharsis; a rigid diet; and still more, abstraction of those excitants to which the nervous system may have been habituated,—as alcoholic liquors or tobacco. Some of the most distressing cases of supersensitiveness, which the writer has seen, have occurred in persons who had suddenly left off chewing or smoking.

The treatment must, of course, vary with the cause, which must be removed whenever practicable. A tonic system of management, with a generous diet, and a thorough change of all surrounding influences, must be advised. Narcotics, especially hydrocyanic acid and lactucarium, have been recommended, but they are rarely of service. The more active narcotics—as opium—are often found, indeed, to be positively injurious. The supersensitiveness may be diminished whilst the patient is under their influence, but it recurs to a greater extent when the narcotic influence has passed away.

ROBLEY DUNGLISON.]

HYPERTROPHY, (from ὑπὲρ and τροφὴ, signifying an excess of nutrition,) is a term applied by pathologists to that condition of a tissue or organ which presents an increase of substance, not arising from any transformation of tissue, or from the development of any morbid product, but simply from a preternatural growth of its proper organic textures. For example, a muscle is said to be in a state of hypertrophy when its size exceeds the ordinary standard, provided it still retains its muscular structure; but the term hypertrophy could not with propriety be applied if the increased size of the muscle were produced by the transformation of its fibres into fat, or by the development of a tumour in its interior.

As hypertrophy is only an increased development of the natural structure, it cannot strictly be considered as constituting a disease, unless when it deranges the functions of the hypertrophied organ, or exercises an injurious degree of pressure on the neighbouring parts. The muscles on the fore-arm of a pugilist or of a blacksmith, though hypertrophied to double their natural dimensions, are so far from constituting a disease, that they afford a good criterion of the health and strength of the individual; whereas there are few diseases more formidable than a similar condition of the muscular walls of the heart. Indeed it is only of late years that hypertrophy has attracted the attention of anatomists as occurring in any other organ than the heart. The accurate researches of modern pathologists have, however, clearly demonstrated that several tissues, especially the muscular, the adipose, the cellular, the mucous, the cutaneous, the nervous, the vascular, the fibrous, and the osseous, are liable to this affection; and that any organ into whose composition these tissues enter, may be generally hypertrophied throughout its entire structure, or may have the hypertrophy confined to one or more of its component parts. Sometimes, indeed not unfrequently, it happens that by virtue of a sort of balance in the nutritive powers of the part, in proportion as one tissue is hypertrophied another becomes atrophied, in which case the original structure of the organ is so completely changed, that it becomes exceedingly difficult to recognise it. In hypertrophy of the white acini of the liver, accompanied with atrophy of the red acini of the same part, the natural appearance of the organ is materially changed; and in those cases where its cellular tissue is so hypertrophied as to form large masses of a pearly white colour, intersected by opaque membranous septa or partitions, producing an appearance not unaptly compared to the section of a turnip, the natural structure of the viscus is so completely altered that pathologists have not hesitated to refer the alteration to the development of the non-analogous accidental production named scirrhus.

As the effect of excessive nutrition is to increase the number of molecular atoms which enter into the composition of the part, it generally follows that a tissue or organ in a state of hypertrophy becomes thicker and larger than in its natural state. Sometimes, however, the effect of hypertrophy is to increase the density rather than the bulk of the part, as is exemplified in hypertrophied bones, which occasionally become as dense and as compact as ivory, without undergoing any change in their external form or dimensions. Indeed the size of an organ would in many instances afford a very erroneous index of the state of its nutrition, for we know from observation that the hollow organs may be in an extreme state of hypertrophy without having their size apparently increased, in consequence of the supernumerary particles being deposited on their internal surface, and at the expense of their cavities, as in concentric hypertrophy of the heart: and that, on the other hand, these organs may be greatly increased in size without being in the slightest degree hypertrophied, as is exemplified in the skulls of hydrocephalic persons, and in passive dilatations of the heart, bladder, stomach, &c.; in all of which cases the parietes of these organs are in fact thinner than natural, and their increased size is produced by mechanical distension independently of any increase in the number of their integrant particles. Thus it appears that the natural cavity in a hollow organ may remain unaltered in its dimensions, or may have its capacity either increased or diminished, at the same time that its parietes are hypertrophied. When the dimensions of the cavity remain unaltered, the thickness of the walls, as compared with their ordinary standard, will afford a correct index of the state of their nutrition; when the capacity of the cavity is diminished, the walls may appear considerably thicker than usual, in consequence of the contracted state of their muscular fibres, independently of any increase of substance; and on the contrary, when the cavities are much enlarged, their walls may appear thinner than usual, when in reality their substance is increased, though from its excessive distension it is apparently diminished.

But it is not in the hollow organs alone that an alteration of size may take place independently of any increase of the nutritive function, for considerable enlargement is often produced in various organs by an accumulation of blood in the capillary vessels. There is perhaps no viscus that exhibits this enlargement from congestion in a more marked degree than the liver, especially in those cases where any obstruction exists to the free exit of its blood. We recollect one case, particularly, of aneurism of the aorta compressing the inferior vena cava so as to obstruct considerably the flow of blood from the liver, in consequence of which that organ was enlarged to such a degree as to descend almost to the crest of the ilium. Suddenly, however, the aneurism gave way, and the pressure being thereby removed from off the cava, the hepatic veins were allowed to unload themselves, and the liver had nearly resumed its natural situation and dimensions when the post-mortem examination was made. The spleen is likewise often greatly increased in size by the accumulation of blood in its interior. We have repeatedly observed this effect produced in those cases where the liver was small, indurated, and knobbed on its surface. Another reason why the size of an organ does not always afford a correct criterion of the state of its nutrition is, that the hypertrophy is often confined to one elementary tissue of the part, while one or more of the other tissues which enter into its composition waste away and fall into a state of atrophy, which more than compensates for the increased size of the hypertrophied tissue.

Instead of increasing either the size or density of the hypertrophied tissue, it sometimes happens that the exuberance of nutrition is manifested by the formation of vegetations or projections from its surface, as in fungoid excrescences of the mucous membrane, exostosis, &c.

Hypertrophy may exist simple and uncombined, or may coexist with other alterations of the tissue or organ affected; thus it may be combined with hyperæmia, or on the contrary with anæmia; hence it is that we sometimes find the parts affected of their natural colour, sometimes presenting different shades of red or brown, and sometimes, also, colourless and exanguious. In like manner their consistence is in some cases unaltered, in others, (and they are the most numerous,) increased, and in others again diminished, the tissue hypertrophied being at the same time in a state of softening. (*Andral*, Pathol. Anat.)

We shall now proceed to consider briefly the principal alterations produced by hypertrophy in the different tissues and organs, the causes which seem to favour its production, and the effects to which it commonly gives rise.

Hypertrophy of the Muscles.—The effect of hypertrophy on a muscle is in general to increase its size and render it firmer than ordinary; its fibres become more condensed, contain a larger proportion of colouring matter, and a less quantity of serous fluid; the fat deposited in the interstices of the muscles usually diminishes, while the blood-vessels undergo an increase of size proportioned to the extent of the hypertrophy. Such are the alterations which the muscles of the pugilist undergo during the process of *training*, as it is termed, and such is also, to a certain extent, the condition of any muscle or set of muscles kept in constant and active exercise. On this principle is founded the system of gymnastic exercises, which, when judiciously conducted, have been found so efficacious in improving the strength and correcting the tendency to deformity so often arising from irregular or defective muscular development. Unfortunately, however, it is not the voluntary muscles alone that are liable to hypertrophy; the muscular structure of the heart and of the air-tubes, of the intestinal canal, and of the bladder, are likewise subject to this affection, and in them it is often productive of the most distressing and dangerous consequences. In these musculo-membraneous organs we constantly find hypertrophy of the muscular fibres produced by any cause, whether organic or functional, which increases the frequency and energy of their contractions, provided it continues to act for a sufficient length of time. Thus, diseases of the valves of the heart or its great vessels, by opposing an obstacle to the exit of the blood, stimulate its muscular parietes to increased action, in order to overcome these obstacles, and this increased action eventually leads to their hypertrophy; but the same effect may likewise be produced by long-continued palpitations arising from mental emotion, or from any other cause whatever. (See **Hypertrophy of the Heart.**) In the same way hypertrophy of the muscular fibres of the bladder is produced by an obstacle to the evacuation of its contents, such as enlarged prostate, fungous tumours, or strictures of the urethra, which obstruct the passage of the urine, and so stimulate the bladder to increase its efforts in order to propel its contents; the same effect is also produced by the presence of calculi or gravel, or by any other cause which irritates the bladder directly or sympathetically, and causes it to contract with greater force and frequency than natural. When the bladder is thus affected, its muscular coat may be uniformly thickened, or the hypertrophy may be confined to certain fasciculi which project from its surface like the musculi pectinati of the auricles, and give the interior of the organ a remarkable sacculated appearance. These fibres never acquire the red colour which muscles of the same size have in other parts of the body when hypertrophied by exercise; but like the muscular fibres of the intestinal tube, they remain pale, even when hypertrophied to an extreme degree. The muscular fibres of the bronchi likewise acquire an excessive development from the increased exertions which they are called on to make during protracted attacks of dyspnœa or of violent coughing. In old asthmatic persons, and in the still more numerous class of patients who suffer repeated attacks of dyspnœa from organic disease of the heart and congestion of the bronchial membrane, we have constantly found the transverse muscular fibres of the bronchi, which in the natural state are scarcely perceptible, so increased in size as to form distinct fasciculi.

Another frequent cause of hypertrophy of the muscular parietes of these organs is *inflammation*, especially when of a chronic character, and affecting their lining or investing membranes. Thus, pericarditis, terminating by the formation of adhesions, is often followed by hypertrophy of the heart; and though it is difficult to adduce positive evidence that inflammation of the internal membrane of the heart is capable of producing hypertrophy of its walls, yet the conclusion is almost justified by analogy. The effect of chronic inflammation of the mucous membrane of the bronchi in producing hypertrophy of the subjacent muscular fibres has already been noticed. A similar effect is frequently produced by irritation or chronic inflammation of the mucous membrane of the bladder, arising from the presence of calculi, &c. In chronic dysentery the muscular fibres of the colon are in general greatly hypertrophied. Hypertrophy of the muscular coat of the stomach is also frequently produced by chronic irritation of the mucous membrane of that viscus. (*Broussais*, Phlegmasies Chroniques.) The hypertrophy of this tunic is usually accompanied with a similar condition of the other sub-mucous tissues, and this state of the viscus is commonly described as the effect of scirrhous degeneration. In such cases, on making an incision through the thickened parietes of the stomach, we find—1. The mucous membrane sometimes sound and sometimes altered in various ways. 2. Immediately beneath this, a layer of a milk-white colour, varying in thickness from less than a line to several inches: this is the sub-mucous cellular tissue. 3. Beneath this layer appears another, distinguished by its bluish colour, semi-transparent, and with a peculiar kind of lustre, traversed by an infinite number of opaque lines: this is evidently the muscular coat in a state of hypertrophy. 4. Still more externally there may appear a second layer of a dead white colour and homogeneous texture; this is in fact the sub-peritoneal cellular tissue, which has become thickened and indurated like the sub-mucous. In some cases, the cellular tissue remains unaltered, and the muscular coat alone is hypertrophied so as to produce considerable thickening of the stomach or intestines. It is in the pyloric portion of the stomach especially that this form of hypertrophy has been observed; and this is also one of the parts where in the natural condition the muscular coat of the alimentary canal is of the greatest thickness, and its action most remarkable. On opening the abdomen of a living animal we find that the right end of the stomach, the pylorus, and the commencement of the duodenum, are continually animated with a contractile motion. This motion is most distinct during the process of chymification, whence it follows that whatever tends to excite the mucous membrane of the stomach must tend to increase the action of the muscular fibres of the pylorus, and eventually to produce in them a state of hypertrophy. (Andral's Path. Anat.) We have seen these fibres hypertrophied to such a degree as to measure nearly two inches in thickness, and to present a striking resemblance to the gizzard of birds. Dr. René Prus observes that the frequent vomitings which occur in persons labouring under chronic gastritis may contribute very much to produce the hypertrophy of the muscular fibres that so often succeeds to protracted attacks of this disease.*

From whatever cause the hypertrophy of the hollow muscular organs arises, the effect of the excessive development of their fibres is to increase their force and irritability, and consequently the frequency and energy of their contractions. The bladder, when hypertrophied, says Dr. Baillie, becomes extremely irritable, the inclination to make water is frequent, and repeated efforts of the muscular coat are required, which increase its thickness more and more. In like manner the irritability of the transverse fibres of the bronchi is increased in proportion to their increase of development, until the slightest irritation becomes sufficient to excite them to violent contractions. In such cases, any irritation of the mucous membrane produces violent paroxysms of dyspnœa and coughing, which in their turn increase the hypertrophy of the muscular fibres, and so the disease becomes progressively aggravated. Similar effects are likewise produced in chronic dysentery by hypertrophy of the muscular fibres of the rectum and colon, until eventually the presence of the least quantity of feculent matter is sufficient to induce the most violent spasmodic efforts for its expulsion.

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* Recherches sur la Nature et le Traitement du Cancer de l'Estomac.

The symptoms produced by hypertrophy of the heart are of such importance as to merit a special article to be devoted to their consideration; to which, therefore, the reader is referred. — See HEART, (HYPERTROPHY OF THE).

Hypertrophy of the Adipose Tissue. — The adipose or fatty tissue is of all others the most subject to hypertrophy: it is in general largely developed in infants immediately under the integuments, but seldom accumulates at that age on the internal organs. After the second or third year the tendency to obesity usually disappears until the period of puberty, at which time, especially in females, it again makes its appearance, though it very seldom becomes excessive before the age of five-and-twenty. It has been calculated (Dictionnaire de Médecine. Art. *Polysarcie*,) that the average weight of an adult of ordinary robustness is about eleven or twelve stone, of which fat constitutes about one-twentieth part; in some cases, however, it is developed in such enormous quantities as to constitute from one-half to four-fifths of the entire weight: and there are cases on record of persons becoming so prodigiously laden with fat as to weigh from thirty-five to forty stone. M. Dupuytren has published an account of the dissection of a remarkable case of this kind. The individual (who was a poor beggar woman, totally dependent for her daily sustenance on the precarious contributions of charity,) measured five feet one inch in height, and five feet two in circumference. The subcutaneous layer of fat was three inches deep on the thighs, four inches on the glutei, and seven inches on the mammæ. In the interior of the body the only parts which were completely exempt from fat were the skull and the spinal canal. In the thorax there was no fat developed between the fibrous and serous layers of the pericardium; but it was accumulated in enormous quantities at the base and on the surface of the heart, and in the mediastinum, and was also deposited in large masses between the costal pleura and the ribs. The pulmonary pleura contained no fat. In the abdomen the peritoneum was everywhere coated with a thick layer of fat, except where it was reflected over the liver, the spleen, and the small intestines: between the peritoneum and the diaphragm it was developed in large quantities, as also between the peritoneum and the muscular coat of the stomach and colon, from the latter of which it hung in fringes two inches long and three quarters of an inch in diameter. In the mesentery it measured two inches, and in the greater and less omentum one inch in thickness. No organ appeared to have undergone the fatty degeneration except the mammary glands. The muscles retained their red colour, and even seemed to have acquired an increased development, as if for the purpose of increasing their force in proportion to the increased mass which they had to move. (Journal de Corvisart, tom. xii. p. 292.) This case exhibits a striking instance of the influence of idiosyncrasy in producing general hypertrophy of the adipose tissue; for the individual in question was scantily supplied with a most meagre diet, and took a great deal of exercise every day; in short, led precisely that kind of life which is supposed to be least favourable to the accumulation of fat. Hypertrophy of the adipose tissue may likewise occur as a local affection. We not unfrequently find (more especially in persons advanced in life who have indulged freely in the pleasures of the table) fat accumulated in such quantities in the abdomen as to give the belly a size altogether disproportioned to the rest of the body. The mammæ in some females are enormously laden with fat; and the quantity of this substance deposited on the glutei muscles is so great in some cases as to constitute an absolute deformity, as in the African woman, named *the Hottentot Venus*, who was exhibited in this country some years ago. Lobstein relates the case of a child, one of whose thighs was so laden with fat as to measure twice as much in circumference as its fellow of the opposite side. (Traité d'Anatomie Pathologique.)

It seldom happens that fat is developed in such quantities on any of the internal organs as to impede their functions, unless in cases of general obesity; the heart, however, is sometimes greatly overloaded with fat, particularly at its basis, along the septum, and at the apex of the right ventricle. Indeed, this condition of the viscus is by no means uncommon in advanced life even in persons of moderate embonpoint. We have generally found it coinciding with a pale flabby condition of the muscular fibres, and not unfrequently combined with a general dropsical diathesis. It does not appear that this condition of the organ produces any material or permanent derangement of its functions, or that it is characterized by any peculiar symptoms by which its existence may be recognised during life. Fatty tumours are occasionally formed in different parts of the body, and constitute another variety of local hypertrophy of the adipose tissue.

Respecting the immediate or proximate cause of hypertrophy of the adipose tissue, little is known beyond conjecture. Some individuals accumulate fat under circumstances in which others would almost die of inanition. Certain circumstances, however, have been ascertained by experience to be peculiarly favourable to obesity, among which may be enumerated full living, sedentary habits, and the want of mental excitement. Castration has likewise been observed to promote the accumulation of fat, and the same effect is produced by the removal of the ovaries from the female.

Hypertrophy of the Cellular Tissue.—The following description of the anatomical characters of this lesion has been borrowed from M. Andral, to whom we are indebted for the first and most accurate account of this morbid alteration of structure.

"The cellular tissue is frequently affected with hypertrophy: in those parts where it naturally possesses but little consistence, and resembles a sort of organized mucus, it acquires, when hypertrophied, a greater degree of firmness and density; and in the parts where its density is naturally considerable, its laminæ and filaments acquire an unusual thickness, become blended together, assume a dull white colour, or a peculiar grey semi-transparent appearance, and offer considerable resistance to the scalpel. When the hypertrophy has arrived thus far, we observe between the organs, or the different parts of the same organ (according to the seat of the disease), a whitish substance in the form of laminæ, or of irregular masses, intersected by numerous lines and striæ; and if we examine the structure of these masses, and trace their formation, we find that they are evidently composed of portions of cellular tissue, which become progressively more and more condensed, and finally present the appearance of a homogeneous mass, which, according to its colour and degree of condensation, resembles either the interior of a turnip, with its dull white striæ, the fat of bacon, or imperfect cartilage, such as is found in the fœtus.

"These different alterations of structure have hitherto been confounded under the generic denomination of schirrus, whereas they are all produced by hypertrophy of the cellular tissue, in some cases simple and uncombined, in others conjoined with some product of a morbid secretion into the areolæ of the cellular texture." (Op. cit.)

Hypertrophy of the sub-mucous cellular tissue of the alimentary canal is very frequently produced by chronic irritation of the mucous membrane, more especially in cases of chronic gastritis and dysentery. In the urinary apparatus it is also often caused by irritation or chronic inflammation of the membrane to which it is subjacent. Hypertrophy of the sub-mucous cellular tissue of the urethra is one of the most frequent causes of stricture. We have never observed the sub-mucous cellular tissue hypertrophied to any great degree in the air-passages of the respiratory apparatus. The sub-cutaneous cellular tissue is often very much thickened in the neighbourhood of old ulcers, and of eruptive diseases of long standing. Hypertrophy of the cellular tissue is likewise observed in the parenchymatous structure of several organs: sometimes the proper texture of the part remains unaltered in other respects, and the only change observable is, that the cellular tissue which intersects and supports its structure is rendered thicker, harder, and more opaque than natural. This appearance is often observed in the pancreas, thyroid, and mammary glands. More frequently, however, the proper tissue of the part falls into a state of atrophy, or even disappears altogether, and the cellular tissue which formed its original frame-work acquires a preternatural development, so as to form considerable masses of a white colour and striated appearance, not unlike the section of a turnip. This alteration of structure we have observed most frequently in the liver and spleen. Another form of hypertrophy of the cellular tissue is that in which one or more of its cells are dilated and their walls thickened, as in the serous cysts which are found in the kidneys and ovaries, and attached to the choroid plexus.

Hypertrophy of the Mucous Tissue.—This is a frequent result of long-continued or often repeated attacks of inflammation. When the mucous membrane of the stomach or intestines is affected with hypertrophy, it generally becomes harder and denser than ordinary, so that it may be torn off in large shreds. This affection is more common in the stomach and colon than in the small intestines: the membrane, while becoming thicker, sometimes preserves a smooth and uniform appearance; sometimes, being thickened unequally, it presents a number of elevations separated by sinuous depressions. In the large intestine the hypertrophy of the mucous membrane is sometimes so excessive that it exceeds in thickness all the other coats taken together. In the small intestines we have seen the valvulæ conniventes longer, thicker, and at least twice as numerous as they usually are. When the hypertrophy only affects isolated points of the mucous membrane, it produces elevated patches and tumours of various forms, sizes, and textures, which have been designated by the names of vegetations, fungous excrescences, polypi, &c. according to the forms they assumed, and the varieties of consistence and colour which their texture exhibited. (*Andral.*) Sometimes the hypertrophy, instead of involving the entire texture of the membrane, affects only the villi which cover its surface, and in some cases the hypertrophy is confined to the mucous follicles, and the membrane appears studded over with small conical whitish bodies, having each a central pore or orifice in those parts of the intestines where the follicles are isolated; these conical bodies are separate and distinct, but where the follicles are aggregated, they become confluent, and by their assemblage form large clustered patches. Hypertrophy of the follicles occurs most frequently at the lower portion of the small intestines. Like the other varieties of hypertrophy of the intestinal tube, it is usually found in those who have laboured under diarrhœa and other symptoms of local irritation for some period before death.

That portion of the mucous membrane which lines the larynx and bronchi frequently becomes hypertrophied in persons affected with chronic irritation of those parts. The anatomical characters of hypertrophy of this portion of the membrane are nearly the same as in the alimentary canal. In some cases the membrane is generally thickened, in others the thickening is confined to a circumscribed point, where it produces a projecting tumour or vegetation. Andral relates two cases in which the rima of the glottis was almost completely obstructed by whitish cauliflower vegetations of this description. Hypertrophy of the follicles with which the mucous membrane of the air-tubes is so thickly studded, has repeatedly been mistaken for tubercles, and also for the eruption of small-pox. M. Reynaud found the mucous membrane of the bronchi covered with villi in an individual who had laboured under chronic cough and dyspnœa for many years: as no villi are visible in the natural condition of this membrane, their appearance must be ascribed to the effects of hypertrophy. Hypertrophy of the mucous membrane of the minute bronchi, producing considerable diminution of the calibre, is a constant cause of dyspnœa, especially when situated at the orifices of the off-setting tubes. It is to this cause we must attribute the permanent sonorous and sibilous râles that are to be heard in the lungs of some asthmatics. In the genito-urinary organs the mucous membrane presents nearly the same changes from hypertrophy as those we have already described, namely, general thickening or enlargement of its mucous follicles, vegetations, excrescences, &c. These excrescences present considerable variety of texture, some of them consisting of a hard homogeneous tissue apparently destitute of vessels, others of a soft and highly vascular tissue, while others are formed by a mere prolongation of the natural membrane; so that this portion of the mucous membrane, like all others, presents two varieties of hypertrophy, one in which its substance is thickened but its texture not altered, and another in which its texture no longer retains its natural characters. (*Andral*, Op. cit.) M. Louis found the mucous membrane of the bladder covered with villi in a patient who has been affected with hematuria for a number of years. (Recherches sur la Phthisie.) In this case also they must have been morbidly developed, as they do not exist in the natural state of the membrane, or, if present, are so minute as not to be perceptible.

Hypertrophy of the Skin.—The cutaneous tissue, like the mucous, may be hypertrophied throughout its entire structure, or in some one or more of its component layers. Andral relates a very remarkable case of general hypertrophy of the skin occurring in an old woman who died of phthisis in the hospital of La Charité. She had formerly had an ulcer on her right leg, but for the last thirteen years the sore had been cicatrized, while the limb had gradually acquired an extraordinary development. On dissection the thickened integuments were found to consist of the following layers: 1. the corium or cutis vera; 2. the papillary tissue, (*bourgeons sanguins* of M. Gautier); 3. over the papillæ three layers more or less distinct, according to the situation in which the examination was made. The first of these layers appeared like a delicate white line, which, as it dipped in between the papillæ, assumed an undulating appearance: this layer was analogous to that described by M. Dutrochet as the epidermic layer of the papillæ. Immediately over the undulating line just described, appeared another layer of a dark grey or brown colour; when sliced obliquely, it presented the appearance of net-work formed by a number of delicate dark-coloured filaments crossing each other in every direction: this reticular layer was evidently analogous to the coloured layer in negroes. The third or most superficial layer presented a much greater degree of thickness and hardness than the preceding, and in some places exhibited a degree of consistence equal to that of horn: this layer exists only as a rudiment in man, but in animals is more perfectly developed for the production of the various species of shell and horn. 4. External to all these parts was situated the cuticle. (*Andral*, Op. cit.)

Hypertrophy of the Vascular System.—This may be considered as it affects the large blood-vessels, or as it is confined to the capillary system of vessels. The pregnant uterus affords an example of hypertrophy or preternatural development of all the blood-vessels which supply the organ; in like manner tumours and all morbid growths are accompanied with an increased development of the arteries and veins which supply them. It is not, however, always easy to determine whether this hypertrophy of the vascular system precedes or follows, is the cause or the effect of, the increased growth of the solids. Dilatation of the aorta, especially at its arch, is often accompanied with considerable thickening of its parietes: in some cases this increased thickness is caused by the uniform hypertrophy of all the coats, in others the middle coat only is affected; when in this state, its natural organization becomes much more apparent; the yellow fibrous tissue of which it is composed becomes as evident in the human subject as it naturally is in the horse, but never presents any trace of muscular fibre even in the most extreme state of hypertrophy. (Ibid.)

The morbid alteration of structure described by authors under the name of *accidental erectile tissue*, is caused by hypertrophy of the capillary vessels of the part, which become increased both in size and number, and by being clustered and matted together like the vessels of the placenta, (Lobstein, Anat. Path.) form vascular patches or tumours of various shapes and sizes. In some cases these tumours are composed entirely of the capillary vessels in a state of hypertrophy; in others the tumours are composed principally of other anatomical elements, such as excrescences from the mucous membrane, encephaloid tissue, &c., and the capillary vessels, though greatly increased both in size and number, form merely an accessory part of the structure of the morbid growth.—(See Fungus Hæmatodes.) M. Recamier states that the greater number of hemorrhoidal tumours are composed of the capillary vessels of the anus in a state of hypertrophy. (Dictionnaire de Médecine.)

Hypertrophy of the Nervous Tissue.—This has been observed in the brain, spinal marrow, and nerves. The anatomical characters of *hypertrophy of the brain*, as described by Dr. Dance, in the fifth volume of the *Répertoire d'Anatomie*, &c. are the following: "The convolutions of the brain are compressed and flattened, the intervals between them disappear, and it seems as if the investing membranes of the brain had become too tight for it; the substance of the organ is firm, contains but little blood, and appears remarkably dry when cut into. The ventricles are almost entirely effaced, and the various surfaces of the brain deprived of their ordinary moisture." The affection generally involves both hemispheres, but is sometimes confined to one, or even to a part of one. Andral met an instance where the left thalamus opticus was one-fourth larger than the right, which was of its natural dimensions. Laennec mentions, in the second volume of the *Journal de Corvisart*, his having found the brain compressed and squeezed, as if the skull were too small to contain it, in different individuals whom he had supposed to be affected with hydrocephalus. In a memoir published in the *Révue Médicale* for December, 1828, M. Meriadec Laennec has detailed several cases of this disease, from which he concludes that this change of structure is not excessively rare in its occurrence; that it is constantly accompanied with symptoms of epilepsy; that it develops itself with much greater rapidity than hypertrophy of any other organ, which he attributes to the organization of the texture in which it is seated; and, lastly, that the causes of the lead colic appear to have a very great influence in developing hypertrophy of the brain. In some cases the increased growth of the brain is so considerable as to produce an evident enlargement of the skull.

Dr. Elliotson relates the case of a lad who was remarkably precocious; his head was larger than the ordinary size of adults; he suddenly became apoplectic, hemiplegic, and died. On dissection the brain appeared much larger than it should be, and looked as if it had been ready to burst the skull asunder. (Medical Gazette, No. 217.) A similar case is recorded by M. Scoutetten, in the seventh volume of the *Archives de Médecine.* A child only five years old had an enormously large head, totally disproportioned to his age and size; his intellect was not in any way remarkable; his general health was good; and he died of an acute attack of gastro-enteritis. On dissection, the dura mater was found firmly attached to the skull, and the brain filled the head so completely, that on the roof of the skull being removed, it started out as if it had been relieved from considerable pressure: it was principally the superior and posterior parts of the hemisphere which had acquired this extraordinary development; for on making a perpendicular incision into the lateral ventricles, it was necessary to make a section three inches deep to reach them from above, while from below they were within an inch of the surface. It does not appear that this condition of the brain is constantly attended with any particular derangement of its functions; in the case related by M. Scoutetten, there were no symptoms of cerebral disease; in M. Laennec's cases the symptoms were those of hydrocephalus. In those detailed by his cousin M. Meriadec Laennec, the patients had paroxysms similar to those of epilepsy; and in the cases observed by Andral, the symptoms were in some instances analogous to those of epilepsy, and in others the individuals were suddenly seized with convulsions, in the midst of which they expired. (Op. cit. p. 775.)

Hypertrophy of the Spinal Marrow presents the following characters: its substance is remarkably firm, and so increased in size as to fill up completely the cavity of the vertebral canal. (*Andral,* Op. cit.) Laennec found the spinal cord affected in this way throughout its entire length. Andral found the cervical portion of the cord hypertrophied in a child affected with epilepsy. Hutin, (Bibliothèque Médicale, 1828,) Ucelli, (Clinica dello Spedale della Sta. Maria di Firenze, 1823,) and Ollivier, have likewise described this disease: respecting its pathology nothing certain is as yet known.

The Nerves are also liable to an excessive development from hypertrophy. The ends of the nerves after amputation often become very large, and have their sensibility morbidly increased. Bichat describes this alteration as occurring frequently in the neighbourhood of organs affected with cancer. Gendrin found the nervus saphenus of three times its ordinary thickness, in the neighbourhood of a chronic ulcer on the leg of an old man. The same appearances have been also seen and described by Swan. (Observations on some Points relating to the Nervous System.)

A remarkable instance of hypertrophy affecting detached points along the course of the nerves, in a cretin, is recorded in the London Medical and Physical Journal, for 1826. The inferior maxillary nerve presented several swellings as large as peas in all its branches, and the portio dura of the seventh, the eighth pair, and almost all the spinal nerves were similarly affected; the ganglions of the sympathetic were much larger than usual; that opposite the sixth vertebra was as large as a hen's egg flattened. This preternatural development of the ganglionic system has likewise been observed by other anatomists in cases of congenital idiocy. (Essai sur l'Idiotie, par Belhomme.) Dr. Duncan found the abdominal portion of the sympathetic nerve increased to three or four times its natural size in a case of diabetes, and Lobstein found the supra-renal plexus greatly hypertrophied in a case of diseased supra-renal capsule. We have already stated, when speaking of hypertrophy of the vascular system, that in all cases of preternatural development or morbid growths, the blood-vessels which supply the part exhibit a proportionate increase of size; the nerves have not been observed to undergo a similar change. In hypertrophy of the nerves, it is important to distinguish whether the nervous pulp is affected, or merely its neurilema.

Hypertrophy of the Fibrous Tissue.—This is usually produced by irritation or chronic inflammation. This tissue has a remarkable tendency, when hypertrophied, to be transformed into fibro-cartilage, and to pass from thence by a second transformation into bone. These successive changes are frequently exemplified in the margins of the different orifices of the heart and in the valves, the thickening and subsequent ossification of which often arise from hypertrophy of the fibrous tissue, which enters in a rudimentary state into their anatomical structure.

Hypertrophy of Bone.—The osseous system presents two forms of hypertrophy, according as its animal or calcareous substance is principally affected. In some cases both these alterations are combined. The bones are sometimes found uniformly enlarged throughout their entire structure, so as to attain in some instances to double their ordinary size and weight. This form of hypertrophy, which seems productive of no inconvenience during life, is seldom or never confined to a single bone, but affects the entire set, whether of the cranium, the thorax, the pelvis, or the upper or lower extremities; it is generally supposed to be congenital. Dr. Gall states that the skulls of idiots from birth are much thicker than those of other men, (Dict. des Sciences Méd., art. *Crane,*) and Lobstein remarks that the skulls of dwarfs are not only large in proportion to the other parts of the body, but that they actually exceed in size and weight the skulls of ordinary sized persons. (Traité d'Anatomie Pathologique.) In rachitis the bones affected usually present an increase of size, accompanied with a diminution of weigh and consistence, owing to hypertrophy of their animal substance, and the atrophy of their calcareous particles; but in some time after the rachitic affection has subsided, the bones usually attain a preternatural degree of density and strength. Mr. Stanley has observed that the copious deposition of calcareous matter, by which this change is effected, takes place principally at the inner side of the incurvated bone. (Medico-Chir. Trans., vol. vii.) In the disease known by the name of fragilitas ossium, the atrophy of the animal substance, which is the immediate cause of the brittleness, is frequently accompanied with hypertrophy of the calcareous matter. The ivory-like induration, or *eburnation* as it has been termed, is most frequently met with in the flat bones of the cranium, and in the extremities of fractured bones between which a false joint has been established. A minor degree of condensation of the osseous structure is frequently caused by injury and inflammation of the part, or of its investing membrane, as in the union of fractures, &c. Dr. Gall preserved in his museum the skull of a soldier who received several severe blows on his head from the butt-end of a musket at the battle of Ohakow; he became delirious in consequence, and lived in that state for thirty years; the bones of his skull were exactly like ivory. Several anatomists have observed that the skulls of furious maniacs are remarkable for the extreme density and compactness of their texture: this alteration is in all probability connected with the irritation of their meningeal membranes. Nodes and exostoses are examples of local hypertrophy of the osseous system.

Hypertrophy of the Lungs.—Laennec has remarked that when one of the lungs is destroyed, or from any cause rendered unfit for the performance of its functions, its fellow acquires a double energy, consequently an increase of nutrition, and after a certain time an augmentation of volume, and becomes at the same time firmer, more elastic, and compact. In place of collapsing when the chest is laid open, it sometimes protrudes from it, as if the space that contained it were too small. In instances of this sort it cannot be doubted that the air-cells are enlarged, and that their parietes have acquired a preternatural thickness, although it is extremely difficult to prove this even with the aid of the microscope. Hypertrophy of the lungs is sometimes formed in a very short space of time: in the case of a man who had pleurisy and consequent contraction of the chest, the opposite lung was found hypertrophied in the highest degree only six months after the commencement of the disease. (Laennec on Diseases of the Chest.)

Hypertrophy of the Liver.—This gland is frequently affected with hypertrophy. In its natural state it is composed of two distinct substances; one reddish, formed chiefly by the minute ramifications of the capillary blood-vessels; the other white or yellowish, which seems chiefly destined for the secretion of bile; these two substances, together with their frame-work of cellular tissue, form the parenchyma of the liver, and the hypertrophy may be confined to either of the substances singly, or may affect them all conjointly. These different forms of hypertrophy produce several varieties in the colour, consistence, and form of the organ, which are usually attributed to the development of new morbid productions, such as schirrhus, cirrhosis, &c. There are two degrees of hypertrophy of the white substance; in the first, the parenchyma of the organ is traversed by lines or circumvolutions of a yellowish white colour; in the second, both its interior and exterior are studded with numerous granules, either isolated or agglomerated, and remarkable for their colour, resembling that of yellow wax; these yellow granules, which are merely the white substance in a state of hypertrophy, Laennec regarded as an accidental tissue developed in the liver, and termed it cirrhosis, from its colour. This affection is described by Baillie as the *common tubercle* of the liver, and is generally known in this country by the name of *drunkard's liver*. The red substance is likewise susceptible of a very remarkable kind of hypertrophy, which produces in the interior of the liver small hard red masses, distinguished from the surrounding parenchyma by their greater consistence and deeper colour. The cellular tissue of the liver is likewise liable to hypertrophy, in which case the organ loses its peculiar structure and organization, and large patches are found in it occupied only by cellular tissue in a state of hypertrophy. In all those cases the hypertrophy of one of the elementary tissues of the liver is accompanied with a corresponding degree of atrophy of the other tissues; but in some instances they all participate in the hypertrophy, and the parenchyma of the organ acquires an extraordinary development. This increased growth of the parenchymatous structure of the organ may take place in all the three lobes, or may be confined to one of them. Sometimes the right lobe is the one affected, and constitutes almost the entire organ, the left appearing like a small appendage attached to it; sometimes, again, it is the left lobe that is particularly enlarged, and the liver then projects considerably into the left hypochondrium, and, when felt through the abdominal parietes, might be taken for the spleen; in other cases the projection is observed only in the epigastrium, when it might be mistaken for a tumour of the stomach. (*Andral*, Op. cit.) The causes that give rise to the different forms of hypertrophy of the liver are as yet unknown, it being a mere hypothesis to attribute them to inflammation; neither are we acquainted with any peculiar symptoms by which they may be detected or discriminated during the life of the individual from each other, or from other organic changes of that viscus. When the liver is much increased in size, its dimensions may be ascertained with tolerable accuracy by the extent of surface, which yields a dull sound on percussion.

Hypertrophy of the Spleen.—The spleen is more frequently perhaps than any other organ enlarged beyond its natural dimensions: this increase of size, which is sometimes very considerable, is most commonly produced by the accumulation of blood within the splenic cells, but in some cases arises from a true hypertrophy of the parenchyma of the organ. When cut into, the natural structure seems to be preserved, except that it is much more solid and condensed than usual, and is intersected by a number of opaque white lines, formed by the hypertrophy of its septa. Dr. Baillie states, that though this may be looked upon as a monstrous growth of the spleen rather than as a disease, yet it may produce inconvenience by its pressure, and by altering in some degree the situation of the neighbouring viscera. (Morbid Anatomy.)

Hypertrophy of the Pancreas.—This gland is sometimes greatly hypertrophied, and as the cellular substance which intersects its substance participates in the affection, the viscus loses a good deal of its natural appearance, and is converted into a hard white mass, intersected by opaque membranous septa, not unlike scirrhus in other parts of the body.

Hypertrophy of the Kidney.—The kidneys are sometimes found much larger than usual, without exhibiting any other change of structure; indeed, it generally happens that when one is incapable of performing its functions, either from original malformation or disease, the other, having double duty to perform, becomes preternaturally enlarged. Hypertrophy of the kidneys is said to be a frequent appearance in diabetes. (*Andral.*) We have, however, seen several exceptions to this statement.

Hypertrophy of the Lymphatic Glands.—The lymphatic ganglions are frequently found in a state of chronic enlargement. We have seen the mesenteric glands in tabes mesenterica increased to four or five times their natural size, without presenting any appearance of degeneration or transformation of tissue. Cruikshanks mentions an instance in which the lymphatic glands in the neighbourhood of the bifurcation of the trachea were affected with this morbid change to such an extent as to cause fatal suffocation. In the internal iliac glands it is not uncommon, so as to form large indurated masses, and in the female may operate as a cause of difficult parturition, equally fatal to the mother and the child. (Anatomy of the Absorbing Vessels.)

Hypertrophy of the Thyroid. — Hypertrophy of the thyroid constitutes the disease known by the name of goitre or bronchocele, which is endemic in certain countries, and is generally supposed to depend on certain conditions of the air and water. (See BRONCHOCELE.)

Hypertrophy of the Thymus. — It is by no means uncommon to find the *thymus* preternaturally developed in scrofulous or rachitic children. We have seen it so large in some cases as to cause an evident projection of the sternum.

Hypertrophy of the Mammary Glands.—The mammary glands are sometimes enormously developed. Dr. Joerdens relates an instance in which they grew to such a size as to reach down to the thighs. (Hufeland's Journal.)

Enlargement of the prostate arising from an increased development of its natural structure is by no means uncommon at an advanced period of life: this affection may involve the entire gland, or may be confined to one of its sides, or to its middle lobe. Hypertrophy of the prostate causes considerable difficulty in voiding the urine by mechanically obstructing the neck of the bladder; it likewise occasions a difficulty in passing the fæces by its pressure on the rectum.

From the brief sketch we have drawn of some of the most remarkable effects of hypertrophy on the several tissues and organs in which it has been observed, it appears that this affection is one of extremely frequent occurrence, and productive of a great variety of morbid appearances which pathologists have only recently learned to refer to their true source.

If, from the consideration of the physical characters of this affection, we turn to the investigation of its immediate or proximate cause, we find that it consists in an excessive activity of the natural function of nutrition. In order to describe the mechanism of this excessive nutrition, it will be necessary to premise a few observations on the mode in which this process is accomplished in the natural or healthy state. The process of nutrition essentially consists in the several solids alternately receiving from and returning to the common nutritive fluid, the blood, a succession of particles similar to those of which their structure is naturally composed. The appropriation of the new particles is termed assimilation, and the detachment and removal of the old particles is known by the name of de-assimilation, or of interstitial absorption. Various opinions have been entertained by pathologists respecting the mechanism by which these changes are accomplished. According to Bichat, each organic tissue is supposed to have its appropriate exhalant arteries, from which it derives the materials requisite for its nutrition; these exhalants he supposes endowed with a peculiar sensibility, by virtue of which they are enabled to select from the blood and convey to their destination those precise ingredients which are fitted for the building up of the tissue or organ they supply; for example, he supposes that the bones possess a set of exhalant actions, which convey nothing but the calcareous phosphates; that the muscles have likewise a set of exhalants that convey only fibrine; and that there are likewise a particular set of nutritive exhalants for conveying albumen, gelatine, &c.: he likewise supposes the existence of a separate set of vessels for the removal of each of these substances. The existence of such a series of vessels has, however, never been demonstrated by dissection, and it is now generally believed that the elements of all the secretions are contained in the blood; that this fluid, holding all the different elements in solution, is conveyed by the capillary circulation to the intimate structure of the different solids, and that it is only by the plastic force inherent in the solids themselves that these elements are separated and applied to their destined purposes. According to this view of the subject, it is the several tissues themselves and the molecules of which they are composed that select their constituent ingredients from the blood, and appropriate them to their construction and support; and the power of assimilation is shared by every particle of every living solid in the body. This faculty of assimilation is compared by Lobstein to the action of a crystal, which when plunged in a saline solution attracts towards itself and promotes the crystallization of those saline particles homogenous to itself, which were suspended in the fluid; so in like manner he conceives the organic molecule selects from the blood those elements which are homogeneous to it. (Traité d'Anatomie Pathologique.)

In hypertrophy this assimilation or plastic force is preternaturally increased, and the consequence is that an excessive quantity of nutritious particles are assimilated, and the tissue or organ affected is over-nourished, that is, hypertrophied. Andral supposes that the same effect may be produced by a defect in the activity of the de-assimilating powers; that the absorbents do not carry away the materials they ought; and that in this way an accumulation of nutritious particles takes place independently of any increase in the assimilating powers of the part; and he adduces, in support of this hypothesis, the well-known fact that hypertrophies which have been combated in vain by bloodletting and emollient applications, often yield to the use of stimulants, such as iodine, mercury, &c. Again, the production of this alteration of structure has been by many pathologists attributed to an increased afflux of blood towards the part affected. This increased local determination of blood may readily be conceived to perform a very important part in the production of hypertrophy, but cannot be considered as its sole, or even as its most efficient cause; for it is evident that the increased determination of blood to an organ can of itself only produce the congestion of that organ, but can never cause its hypertrophy unless when aided by a corresponding increase in the assimilating powers of the part; and if we admit an increase of those powers, the other condition becomes unnecessary, for the increased powers of assimilation, by their more active appropriation of the nutritive particles contained in the ordinary supply of blood, are sufficient to produce the preternatural growth of hypertrophy of the heart, independently of any increase of the quantity of the nutritive fluid. (*Andral*, Op. cit.)

Lastly, hypertrophy has been described by some authors as having an inflammatory origin; but this etiology of the affection, though correct in many instances, is inapplicable to many cases of excessive nutrition. In those unhealthy districts of the Alps, for instance, where bronchocele exists as an endemic disease, the individuals affected are for the most part sickly, pale, and exanguious; there is no evidence in them of any inflammatory actions, either present or antecedent, and yet not only the thyroid, but the liver, the tongue, and the bones are often hypertrophied to an extreme degree in these cases: so also in scrofula and rachitis, the mesenteric glands, the upper lip, and the ends of the bones are often considerably enlarged, and yet such persons are not instances of increased vigour or of the inflammatory diathesis.

It is true that in many cases the first phenomenon which presents itself to our notice in the part where hypertrophy is subsequently to take place, is a degree of local irritation, attended with more or less of sanguineous congestion; but there are also many cases besides those we have specified where no symptoms of any such antecedent irritation can be observed. Indeed, as M. Andral remarks, its existence cannot always be fairly admitted either from analogy or induction; and even when present, it can only be regarded as giving rise to some derangement in the process of nutrition, but is altogether inadequate to account for the peculiar character of the alteration which ensues. In theory we have no reason to suppose that the hypertrophy or increased nutrition of an organ is necessarily preceded by inflammation, and in point of fact we ought not to admit a necessary connection between these two orders of phenomena, since in many cases we find them existing singly, without the slightest proof of having been preceded or accompanied by the other.

In the present state of our pathological knowledge, it is perhaps premature to speculate on the proximate cause of hypertrophy, or to found our treatment exclusively on either of these theories: until we know how the process of nutrition is accomplished in health, it is idle to theorize on its accomplishment in disease. If we cannot comprehend how muscle or bone is formed from the blood in their due proportion, it need be no matter of surprise that we cannot explain how these substances are occasionally formed in excessive quantities. But though we cannot scrutinize the first causes of these processes, we may nevertheless observe the influence of circumstances in modifying their results, even though we cannot in all cases comprehend the precise mode of their operation. Thus, we learn from observation that the extirpation of the testes in the male, or of the ovaries in the female, has a marked tendency to produce an excessive development of the adipose tissue; in like manner we learn that a residence in certain countries causes hypertrophy of the thyroid; that syphilis produces nodes and exostoses; rachitis, enlargement of the ends of the bones; scrofula, of the lymphatic ganglions, &c.; and that irritation of the mucous membrane of the colon produces hypertrophy of the subjacent layer of cellular tissue, although the modus operandi of these causes is by no means equally obvious.

We would, therefore, recommend that the treatment of this affection should not be founded exclusively on either of the theories that have been formed respecting its proximate cause, but that the existence of hypertrophy being once ascertained, we should endeavour to discover, *experimentally*, what are the most efficient means of combating and subduing it. By adopting this method of proceeding, iodine has been discovered to possess the power of dissipating hypertrophy of the thyroid, and mercury has been proved a no less powerful agent in removing certain forms of exostoses. (*Andral*, Op. cit.)

The exciting causes of hypertrophy, so far as we are acquainted with them, may be divided into those which act through the medium of the constitution, and those which act locally. To the first class may be referred,—

1. That condition of climate or soil which renders bronchocele and cretinism endemic in certain districts of the globe. (See BRONCHOCELE.)

2. A peculiar idiosyncrasy or predisposition to the excessive development of the solids generally, or of certain tissues or organs in particular. This state of the constitution is remarkably exemplified in the disposition which certain individuals evince to accumulate fat under circumstances where others would almost die of inanition, as in the remarkable case of obesity related in a preceding part of this article. A still more remarkable case of general hypertrophy is recorded in the first volume of the *Journal Hebdomadaire*, p. 76. The individual was a strong healthy country girl, until

at the age of 18, the menstrual discharge ceased suddenly after exposure to a violent storm, and from that time she became subject to headach, numbness of the limbs, and shortness of breathing: these symptoms were attended with a gradual and progressive hypertrophy of her muscular, cutaneous, cellular, and adipose tissues, until at the end of eleven years after the suppression she presented the following appearances. Her height remained unaltered (five feet two inches); the skull was of the ordinary dimensions, but appeared exceedingly small in comparison to the face, which was enormously developed; the skin of the forehead, the eyelids, and eyebrows, nose, lips, cheeks, and chin, were of such a monstrous size as to suggest the idea of a mask meant for a giant at least eight feet in height. The tongue was so large as to fill the mouth almost completely; the neck could only be compared to that of the Farnese Hercules. The mammæ were of an enormous size, and reached almost to the chin. The circumference of the trunk was equal to the height of the individual: but this prodigious size was not caused by the excessive accumulation of fat alone, as the muscles were everywhere largely developed, and appeared perfectly defined under the skin. The upper and lower extremities seemed disproportionately short on account of their enormous bulk, and the hands are represented to have been quite a curiosity for their size. The heart was hypertrophied in the same proportion as the other parts of the muscular system, and at each contraction struck the chest with such violence as to give the ear, when applied over it, a very smart blow. The brain likewise participated in the affection, and its faculties gradually merged into a state of idiocy. In this case, though the origin of the excess of nutrition may be traced to the suppression of the menstrual discharge, it is impossible to refuse admitting an idiosyncrasy on the part of the individual, as suppression of the catamenia is not necessarily or even generally followed by any such alteration in the nutrition of the solids.

3. Syphilis and the abuse of mercury, which are known to produce hypertrophy of the osseous system in the form of nodes and exostoses.

4. Scrofula and rachitis, which have been observed to cause enlargement of the thymus, lips, and tongue, of the lymphatic and mesenteric ganglions, and of several parts of the osseous system, especially the ends of the long bones.

5. Full living and sedentary inactive habits, which usually dispose to excessive development of the adipose tissue.

Such are the principal general or constitutional causes of hypertrophy which observation has pointed out; but it must be confessed that the enumeration is by no means complete, and that the subject requires further investigation.

Among the principal local causes of hypertrophy may be enumerated the following:—

1. Irritation or inflammation, especially when it assumes a chronic character. We have already stated that this is by far the most frequent cause of hypertrophy. On referring to the descriptions we have given of this affection, it will be found that in a great majority of cases, hypertrophy of the mucous, cutaneous, and cellular, as well as of the fibrous and osseous tissues, may be referred to this source. In such cases the hypertrophy is sometimes confined to the tissue which was previously in a state of irritation, while sometimes, after the tissue originally affected has returned to its natural healthy condition, the adjacent tissues retain a chronic form of disease, and fall into a state of hypertrophy.

2. Increased exercise of the functions of the affected organs. The agency of this cause in producing hypertrophy is most evident in the muscular and glandular system. It has been observed that persons who have lost the use of one arm or leg generally acquire an extraordinary degree of strength in the other, from the increased use that is made of it. In like manner, when one of the double organs, such as the kidneys or lungs, is rendered incapable of performing its functions with effect, the other, having double duty to perform, acquires a proportionate increase of development. Examples of hypertrophy of the muscular structure of the heart, bronchi, stomach, intestines, and bladder, arising from increased exercise of the fibres, have already been adduced.

Treatment of Hypertrophy.—For all that is practically important respecting the treatment of hypertrophy, we must refer to the different articles in which the various species are noticed individually. We shall here content ourselves with a few general observations.

In the treatment of hypertrophy the first and most obvious indication is to remove, if possible, the exciting cause of the disease, as until that object is accomplished, our treatment can at best be but palliative, and in general, when the cause which originally produced the hypertrophy is removed, the nutrition of the organ promptly returns to its natural standard: "ablata causa, tollitur effectus." As the alteration of nutrition is in most cases preceded or accompanied by evident symptoms of increased vascular action, the usual remedies for inflammation, viz., venesection, strict antiphlogistic regimen, and perfect rest, are those most generally indicated; but we must not suppose that these remedies are equally applicable in every case, as the state of the constitution, and the circumstances under which the hypertrophy occurs, sometimes indicate a different or even opposite mode of treatment. When, for instance, the affection arises from scrofula, rachitis, or the residence in a country of cretins, the antiphlogistic regimen would only serve to aggravate the disease, and pure air and generous diet become in such cases the most valuable remedies. So, in like manner, when hypertrophy of one of the lungs or kidneys arises from increased action that is thrown on it by its fellow being incapacitated for performing its functions with effect, the diminution of its increased action, either by the exhibition of appropriate remedies, or, more effectually still, by restoring its fellow to the due discharge of its functions, will be found more efficacious in reducing the nutrition of the hypertrophied organ to its healthy standard than the most active depletory treatment. Again, it would be in vain to attempt combating by general or topical depletion the hypertrophied condition of the walls of the bladder so long as the presence of calculi in its interior kept up the irritation of its mucous membrane, and thereby maintained its muscular fibres in a state of frequent and violent action; for by such treatment we do not remove the cause of the disease, but only palliate its effects. Even this, however, becomes an object of considerable importance to the practitioner, when the cause of the hypertrophy is of such a nature as to baffle our attempts at its removal; as, for instance, in hypertrophy of the heart arising from organic disease of the valves.

There are but few medicines with which we are acquainted that possess any specific control over this affection; of these the most effectual are iodine and mercury. The former has been found a specific in bronchocele, and has occasionally succeeded in dissipating enlargements of the lymphatic glands; and mercury has been found highly serviceable in removing enlargements of the bones, especially when proceeding from a syphilitic taint. When the hypertrophy arises from any of the constitutional causes we have enumerated, the treatment should be directed to the removal of that morbid state of the system on which it depends, and of which it is merely a symptom, and the tonic or antiphlogistic regimen prescribed, according as the system requires to be invigorated or reduced. So, likewise, with respect to the topical treatment of this affection: when the part affected admits of such, the applications must be varied according as it exhibits excessive or deficient vascular action: in the first case local abstraction of blood, fomentation and cataplasms may be applied, while in the second case stimulating applications and blisters will occasionally be found serviceable. It is impossible, therefore, to lay down any general plan of treatment universally applicable; each form of the disease must be treated with reference to its exciting cause, and more as the effect of a pre-existing disease than as a specific affection. In a general pathological article like the present, it would be foreign to our purpose to enter into a detailed account of the appropriate treatment of all the varied forms and different varieties of hypertrophy.

R. Townsend.

HYPOCHONDRIASIS. — 1. *Definition and characteristic of the disease.*—Hypochondriasis, or the hypochondriac malady, is a disease in which symptoms of dyspepsia, such as flatulence, eructation, with a sense of uneasiness in the stomach and hypochondria, are combined with a remarkable lowness of spirits or a desponding habit of mind, and a constant disposition to attend to every minute change in the bodily feelings, and to apprehend extreme danger from the most trifling ailments. The last-mentioned feature in the complaint has been particularly selected and strongly described by the nosological writers. "Desperant ægri de suâ valetudine recuperandâ ob ructus, borborygmos, palpitationes, tremorem præcordiorum, fugaces vertigines, flatulentiam. Hinc persuasi fatum lethale sibi imminere, omnia symptomata et minimas mutationes in corpore suo scrupulosè observant, narrant et describunt medicis, suisque querelis alios mox et alios defatigant, ingenio cæterum et appetitu pollentes." (*Sagar.* Nosolog.) By some writers hypochondriasis has been regarded as a mere variety or accidental modification of dyspepsia. Nearly in this light it appears to have been considered by Hoffmann, who wrote an able but somewhat prolix treatise "de malo hypochondriaco." (Opera Hoffmanni, tom. iii.) He termed it "a spasmodico-flatulent affection of the primæ viæ, namely, of the stomach and intestines, arising from a disturbed and inverted peristaltic action, by sympathy throwing the whole nervous system into commotion, and deranging all the functions of the animal economy. Sydenham in his celebrated treatise on hysteric diseases identifies those disorders with hypochondriasis. He says that the most peculiar symptom is the "making large quantities of urine as clear as rock-water." This, on "diligent inquiry, he found to be the distinguishing sign of those disorders, which we call hypochondriacal in men and hysteric in women." Hoffmann strenuously opposed this doctrine, and insisted on the position that, although the hypochondriacal and hysterical diseases have many symptoms in common, yet they have also several peculiar ones, which fully manifest an essential difference in their nature. Among the reasons which he assigns for this opinion, some of which are quaintly expressed, is the circumstance that "no hypochondriacs were ever judged to be dead, and intended to be interred, which," he says, "is credibly reported of hysteric subjects."

2. *Description of the phenomena.*—A most striking circumstance in the description of hypochondriacal affections is the remarkable difference which is observable between the appearance of the patient and the state of his health as collected from his own account of his symptoms and internal feelings. The individual who labours under this malady seldom presents any external indication of disease; he has often the appearance of sound and even of robust health; yet, if we listen to his statements, every function of life, every part in the whole fabric of his body, is in a state of disorder, and the source of acute and almost perpetual suffering. It was observed by Hoffmann that as fever is the most general of acute diseases, and pervades the whole frame and every function of the body, so among chronic complaints this seems to be equally extensive in its influence, affecting the nervous system in every part, and everywhere giving rise to local pains or feelings of distress. The more constant of these complaints are referred to the alimentary canal, and it is in the functions belonging to that part of the animal economy that evident traces of real disease are chiefly to be discovered. The patient complains of distension of the stomach and hypochondria, which are inflated with wind; he often refers his uneasiness chiefly to the left hypochondrium, where there is in reality considerable fulness and induration: in some instances, there is considerable enlargement of the abdomen, with a degree of hardness and a feeling of consolidation which excite suspicion of some organic disease. The tongue is generally clean, or covered with a slight brown coat; the stomach is the seat of every symptom of disordered action; the appetite is often irregular, sometimes voracious and hardly to be satisfied; more frequently there is a total want of inclination to eat, and even a loathing for food; after eating, the patient complains of a sense of weight and uneasiness in the stomach; sometimes this amounts to rather severe pain, which recurs at a short interval after

every meal; and eructations, cardialgia, or a sense of burning heat at the extremity of the œsophagus, ensue, and after a long time wind is expelled in large quantity, with a sense of cramp succeeding the effort; sometimes viscid mucus is brought up, with half-digested food and a fluid so strongly acid as to corrugate the throat and set the teeth on edge. In other cases nausea prevails almost constantly, and prevents the patient from taking sufficient food for supporting strength; when a small portion is swallowed, it produces great irritation in the system, headach, pulsation in the epigastrium, and flushing in the face; occasionally these symptoms are relieved by vomiting. The patient experiences severe pains through different parts of the abdomen, which he describes as burning, twisting, tearing, and distending the bowels; seizing suddenly different parts of the alimentary canal. He feels a momentary relief when wind is expelled, but the sense of distension soon returns. The bowels are often disposed obstinately to constipation; this state gives way occasionally to looseness; when this last condition supervenes, or when it is brought on by cathartic remedies, all the feelings of distress are aggravated; in addition to his former evils, the patient now suffers an intolerable anxiety, a sense of sinking, fainting, trembling, and apprehends that every minute may be his last: he complains of violent palpitations, pulsations of arteries in the abdomen, burning heats, intolerable anguish, whenever his bowels are brought into action.

In the early periods of the disease the complaints refer more particularly to the abdomen; in a more advanced stage this class of symptoms is not diminished, but others are superadded, consisting of a variety of morbid feelings in different parts of the body, but more particularly in the head. Patients complain of violent pains in the forehead and temples, sometimes in the occiput; of severe and distressing headach with intolerance of light. In more frequent cases, they experience, not pain, but some indescribable sensations which are more difficult to endure than the most severe pain; a sense of intolerable pressure on the top of the head threatens at every moment to extinguish consciousness and life itself; the head is as if squeezed in a vice, the scalp is drawn tight, and the eyes are felt as if starting out of the sockets; these sensations alternate with vertigo or a feeling of giddiness; the eyes sparkle, twinkle, grow dim; vision is impaired; it is impossible to look at a book or to direct the eyes for a moment to any near object without experiencing a sense of confusion; there is a noise in the ears like the ringing of bells, bursting, boiling of tea-kettles, rushing of water; the sound of a steam-engine, strange voices, sudden cracklings, whizzings. The power of attention is destroyed, at least the patient is persuaded that such is the fact, though when aroused, by any sudden intrusion, from his tale of sufferings, he is as lively and acute as ever; he cannot think, his ideas are confused. Sometimes he fancies that his understanding is utterly destroyed, that he shall become insane and die in a madhouse. The susceptibility to all impressions on the senses is morbidly increased. Light, sounds, noises, are intolerable. Mental exertion is often the most difficultly endured of all the causes of excitement. If the feelings are aroused, or the attention is kept alive, especially if it be in the later part of the day, sleep is entirely banished, and a state of general irritation is induced.

The mind labours under a degree of morbid excitement in hypochondriac patients; but this is very distinguishable from all the modifications of insanity. The morbid feelings of the hypochondriac are real; they depend on physical disturbances of the system, which he apprehends to be much greater than they are; and this apprehension leads them to dwell upon them, and make them the subject of conversation whenever he has an opportunity of doing so. Yet he sometimes appears to suspect that the long detail of his sufferings may fatigue the patience or excite the contempt of those who listen to him, and he will even suppress a part of the catalogue of his symptoms, which he is at the same time anxious to communicate. The uncomfortable feelings of the hypochondriac are excessively magnified by his fears and the concentration of his thoughts and attention to his disease, and he may sometimes express weariness of life and a desire that his existence may soon terminate; but it is certain that he is insincere in these expressions, and that he is always under the utmost anxiety to try every possible method for the preservation of his life and the restoration of his health. Such persons will often consult all the physicians of reputation in their vicinity, and will even have recourse to quacks, old wives, and nostrum-mongers; nor is there a remedy that can be suggested too absurd to merit at any rate a trial. An elderly gentleman, who had been for some years labouring under hypochondriasis, combined with amaurosis, sent for a physician in great haste, eagerly requesting an immediate visit. The object of the invalid was to inquire whether any danger would arise from his adopting a remedy which had been strongly recommended by a neighbour or friend. This was to put a piece of stone-brimstone on his head, and walk about the room having it there fixed. He had been persuaded that some great benefits would be derived from this attempt, if it could only be put in practice without risk. The same individual would describe with the greatest minuteness the sensations which he experienced after taking a dinner-pill, and trace its progress through the whole intestinal canal. He could tell by his feelings where the aloes became dissolved, and where it mixed with the aliment, as exactly as if he had seen through the parietes of the abdomen and the coats of the intestines. He would walk about his room in despair, wringing his hands and bemoaning his condition; yet if any person mentioned by chance the subject of a controversy which he was carrying on in a periodical journal, he would forget all his miseries, and enter into conversation with lively interest.

Besides the morbid sensations referred to the abdomen and the head, there are others which affect the limbs. These are sometimes described as if they were neuralgic pains running along the course of the nerves. More frequently feelings of numbness, deadness, tingling, are described as occurring in the legs, arms, or fingers; the head is said to feel dead and benumbed; sometimes this sensation is referred to the back or to the limbs. Sensations which are considered as most characteristic of hysteria are occasionally described by hypochondriac patients. There is a sort of constriction round the throat, threatening suffocation; but this does not amount to globus hystericus, nor is it accompanied with fits of panting or anhelation. The urine, as in many other disorders affecting the nervous system, is copious and colourless. Sydenham mentions the case of a nobleman who laboured, as he says, under "an hypochondriac colic." Whenever he was worse, he voided a clear colourless urine, and on any abatement it became straw-coloured. He was nearly convalescent, when some person coming in suddenly and putting him into a violent passion, "he immediately thereupon made a large quantity of very clear water." The limpid urine of hypochondriac patients has been examined by M. Vauquelin, and found to contain rosacic acid. (*M. Georget*, Dict. de Médecine.)

The functions of the thoracic viscera are sometimes disturbed in hypochondriasis. As in other diseases attended with dyspepsia and flatulence, the heart suffers interruptions in its action; the pulse is often intermitting, more frequently it is variable and irregular; the patient is troubled occasionally with attacks of palpitation, and these are sometimes so severe, and the action of the heart is so violent, as to excite suspicion of organic disease. Nothing is more certain or better known to medical practitioners than the fact that hypochondriacal and hysterical subjects have often been treated under the impression that they laboured under hypertrophy of the ventricles. In some instances hypochondriasis is attended with attacks of dyspnœa and constriction of the chest, a feeling of something squeezing the throat, and other phenomena approaching to those which characterize the paroxysms of hysteria.

All medical authors who have treated on hypochondriasis, and all judicious physicians who have well considered the complaint, are agreed in testifying that the evils which it inflicts are far from unreal and imaginary. To treat them as such, or to let the patient perceive that we do not fully sympathize with him, that we consider his complaint as one which it is in his power by an effort to shake off, is most impolitic and injudicious. Dr. Cheyne, who gave to this disease the designation of the *English malady*, says emphatically, that "of all the miseries which afflict human life and relate principally to the body, nervous disorders in their extreme and last degrees are the most deplorable and beyond all comparison the worst."

No definite observations can be made as to the rise, progress, and duration of hypochondriasis. The causes are chiefly of slow and continued influence, and their effect displays itself for the most part gradually and almost imperceptibly. The disease has been brought on suddenly by some powerful impression on the nervous system, as, for example, by some cause which occasioned overwhelming grief or vexation; but such instances are comparatively few. It continues for years, sometimes through the life of the individual, who cannot escape from the exciting causes which gave rise to it; but it does not of itself shorten life. There is reason, however, to believe that hypochondriacs are more subject than other persons to acquire organic diseases of the abdominal as well as the thoracic viscera; yet on this subject no exact reports are to be found. The long duration of the disease, the circumstance that persons who labour under it are seldom thoughout its course under the care of the same practitioners, and especially that they do not in the ordinary course of things die in hospitals, are sufficient to account for the deficiency of exact information on these points.

3. **Diagnosis.**—One of the most difficult considerations connected with hypochondriasis is the diagnosis of this disease from others with which it is more or less liable to be confounded, and this is likewise the most important point of view in which the subject can be contemplated. The complaints of the hypochondriac are so multiform that they suggest a great variety of morbid affections, and some of these are among the most severe diseases to which the animal economy is subject. The disorders which are symptomatic of hypochondriasis must in their turn be distinguished from the organic diseases which they simulate, or some fatal error will be likely to arise when the medical practitioner either pursues a more active method of practice than the real circumstances of the case require, or neglects to adopt energetic remedies when absolutely necessary in order to avert impending danger.

When an individual is known to labour under hypochondriasis, this circumstance will often throw light on the nature of his temporary ailments. If such a person complains of dreadful pains in the head, vertigo, temporary loss of sensation and of memory, or of palpitation or intermission of pulse, we shall be on our guard, and shall less readily ascribe such complaints to disease in the head or in the heart, than if they occurred in patients under different circumstances. Still the diagnosis is imperfect unless it is absolute on the negative side, for hypochondriacs may and do become the subjects of organic diseases. Nor is the constitutional disorder of these persons always so marked as we might imagine from the foregoing description of their disease. Hypochondriasis does not affect simultaneously and in every case all the functions said to become deranged. Sometimes its manifestations are distinct and strongly marked in the state of the abdominal viscera, and in such cases there is comparatively little ground for mistake. Sometimes the functions of the heart are considerably deranged when the symptoms are elsewhere obscure. In these instances we know that experienced and skilful practitioners have been deceived. When the disorder is principally seated in the head, it likewise occasions difficulties; and these difficulties are not lessened by the circumstance that the diagnosis is on the negative side.

In order to distinguish hypochondriasis from diseases locally affecting the abdomen, an attentive examination will sometimes be required. (See Abdomen, Exploration of the.) Care must be taken to distinguish the disorder which we are now considering from organic diseases of the stomach, in cases attended with long-continued vomiting of the ingesta; from affections of the liver and pancreas; from the results of stricture in the intestinal canal: in other instances, from recent though still sub-acute diseases of the same canal, as from gastro-enteritis, which Broussais is disposed to identify with hypochondriasis. The latter distinction is not always exempt from difficulty; there are many obscure cases in which the disorders are intermixed; and where they exist separately, the diagnosis is not so easy as many persons may be inclined to imagine. We cannot wholly rely on the presence or absence of pain when pressure is made on the abdomen. Little or no pain is in general produced by such pressure in cases of hypochondriasis; and it commonly occasions suffering in some part, when there is much abdominal inflammation. But the mucous membrane of the bowels may be the seat of disease without giving occasion to pain on pressure. On the other hand, hypochondriacs are ready to exclaim whenever they are touched; the excited state of their apprehension augments the real feeling of uneasiness, which depends upon increased sensibility of the sub-cutaneous nerves. It will be found, however, that they bear a strong and continued impression better than a slight and momentary one. The state of the bowels in hypochondriasis is generally rather constipated, and often loose and irritable in gastro-enteritis; but these observations are not very unfrequently reversed. The absence of febrile symptoms; the capability of using exercise; the more healthy appearance of the countenance; the preservation of muscular strength and fulness, with the condition of the appetite, which in many cases of hypochondriasis is unimpaired, and in others greater than usual; will in most instances enable the practitioner to distinguish this disease from gastro-enteric inflammation.

The signs have often been laid down by which disorders of the heart depending upon organic causes are distinguishable from the irregularities arising from dyspeptic and nervous complaints. During the paroxysms of palpitation which belong to this latter description of disease, symptoms are often perceived which lead to the suspicion of organic affection. M. Andral has indeed observed that the pulsations of the heart are often irregular, and accompanied with a "*bruit de soufflet*" in cases purely hypochondriacal or nervous. He has observed violent palpitation succeeded during the interval of the attacks by morbid dyspnœa and even perceptible swelling of the face, in cases which were independent of any organic disease of the heart.

These remarks will be sufficient to show that practitioners should be upon their guard in pronouncing as to the nature of disorders in the functions of the heart affecting hypochondriacs. It would be superfluous under this head to go into detail on the pathognomonic signs of organic diseases of the heart, as these have been fully considered in their proper place. The proof that complaints referred to the heart are hypochondriacal and not organic is likewise in a great measure of a negative kind. If the patient is low-spirited and nervous, if he has been known to be subject to hypochondriasis, the probability is on this side. If he has never undergone any apoplectic, epileptic, or paralytic attack; if he preserves his natural and habitual degree of muscular power, and his senses are not in any way impaired; if all the functions of his brain are uninjured, we may almost venture to conclude that the complaints which he makes of morbid sensations in the head do not indicate so much danger as he supposes. Still, when these complaints are accompanied by discoverable signs of irregular circulation; when the vessels are full and beating forcibly, the head hot and flushed; and when the general appearance indicates a plethoric state of the vascular system in the head, it will be advisable to relieve this state of depletion, either general or local, according to circumstances.

Hypochondriasis must be distinguished from insanity. The discrimination is not difficult. Persons who labour under the former disease have possession of their reason, and the sufferings they describe are really experienced by them, though not so dangerous as they are supposed by the sufferer to be. If a hypochondriac begins to declare that his head or his nose is too large to pass through a door-way, or displays any other hallucination, he has become a lunatic: his disorder has changed its nature, and this conversion takes place occasionally, though it is by no means so frequent as many persons probably apprehend. Hypochondriacs, though low-spirited and dejected, are in a very different state of existence from persons labouring under melancholia. The apprehensions of the former are all centred on the state of their bodily health: on other subjects, they think and often converse rationally and with cheerfulness. The melancholic views all things through a medium of gloom and despondency. Lastly, the feelings and affections of hypochondriacs are not in that perverted and unnatural state which is one of the characteristics of madness in nearly all its forms.

Causes of Hypochondriasis.—There is no particular constitution or temperament of body, at least there is none distinguished by known external characters, that is remarkably subject more than others to hypochondriasis. We have observed this disease frequently affecting persons who bore all the external marks of the sanguine temperament as well as others who had the characters of the melancholic.

The middle period of life, and perhaps the interval between the twenty-fifth and the fiftieth year, is the age which is principally disposed to this disease. It seldom attacks young persons, or, for the first time, those advanced in years. Men are more subject to it than women, though in the latter it not unfrequently occurs. This, however, is seldom the case in respect to young females. With them disorders of the nervous system are more disposed to assume the character of hysteria. Females upwards of fifty years of age are often subject to dyspepsia, flatulence, eructations, gastrodynia, attended with gloom, depression of spirits, and other symptoms of the hypochondriac malady, though not frequently in so strongly marked a form as that which it assumes in men.

The predisposing causes of hypochondriasis, or the antecedent circumstances which are followed by that disease, belong to two different classes, one of which are influences affecting the mind directly and the functions of the body only through this medium: the other series of morbid agents produce their effect, in the first instance, on the abdominal viscera and the processes of physical life; the affection of the mind which follows being apparently dependent on this derangement.

These morbid influences are sometimes blended in the habits of life which produce a peculiar tendency to hypochondriasis. Such are the modes of existence which allow of little bodily exercise, and at the same time occasion an overstrained and continued exertion of the mind. The state of manners in civilized society gives rise to this unfortunate combination of circumstances in a thousand ways, and multiplies, together with the comforts of life, all the sources of mental fatigue and over-exertion, and consequently the number of hypochondriacs. Intense and long-continued exercise of the intellect in one pursuit, whatever it may be, is frequently the cause of this disease. Hence hypochondriasis has been termed the disorder of literary men, "morbus literatorum;" and Hoffmann says that its victims are chiefly "viri chartis impallescentes et inter libros sepulti." Clergymen, school-masters, persons employed in diplomatic business, and in other occupations requiring activity of mind, and giving occasion to sedentary habits, are equally liable to be attacked by it.

Among the classes of sedentary men who frequently become hypochondriacal are tailors and shoemakers. Their constant habit of sitting at their trades, and their peculiar modes of sitting, probably occasion a torpid state of the intestinal canal, and disorder of the functions connected with it. Their minds are also active beyond their craft; witness the proverb, *ne sutor*, &c. and the number of preachers, theosophists, founders of sects, and political reformers, who have arisen from the cobbler's stall and the tailor's board.

There are other classes of persons whose predisposition to hypochondriasis cannot be explained in the same way. Agricultural labourers, men who spend a great portion of their time in working in fields, in digging, making and mending hedges and ditches, and in solitary employments in the country, are frequently affected with low spirits and the other characteristics of this disorder. The solitariness of their employments is probably the chief predisposing circumstance.

Some medical authors are inclined to suppose that hypochondriasis arises almost solely from causes affecting immediately the brain and nervous system. Several French writers have maintained this opinion, and probably it may be better supported by facts in France than in this country. M. Louyer de Villermay, in his work entitled "*Traité des Maladies Nerveuses*," has adduced evidence which bears upon this inquiry, and it is only to be regretted that the sphere from which it was drawn was not more extensive. Out of thirty-six cases of hypochondriasis recorded by this writer, the disease appears to have arisen in twenty-two from "moral affections of a painful description," by which we are to understand causes giving rise to mental distress: in eight cases out of the same number it was occasioned by too close application to study; in two it arose from fright or sudden alarm; in two it followed an immediate transition from a state of life requiring great activity to one of ease and leisure. These facts are favourable to the opinion that hypochondriasis is a primary disorder of the nervous system, a conclusion which has been adopted and supported with much ingenuity by M. Georget. This writer considers the disease in question to be one of the brain, excited by the influence of moral agents, or by those causes which act in a hurtful manner on the mind, and through that medium on the brain. He observes, in support of this opinion, that hypochondriasis is most common in the higher classes of society, among persons occupied in official and diplomatic business, or devoted to literary pursuits. "England," he adds, "is perhaps the country where this species of nervous disease chiefly abounds: this is principally owing to the prodigious activity of mind which exists in that country; to the miseries which are contingent on the great development of industry; to fortunes rapidly acquired in commerce by a number of individuals who subsequently pass their whole lives without employment, in excesses of every description." In this last particular, M. Georget has expressed himself rather conjecturally than from a knowledge of facts. It cannot be truly said that a considerable proportion of those persons who accumulate property in this country by the exertions of industry, abandon themselves afterwards to excesses of all descriptions. Indeed the excesses of vulgar dissipation are not to be reckoned among the ordinary causes of hypochondriasis. This disease seldom attacks persons who are addicted to the immoderate use of fermented liquors; it rather falls to the lot of those who are abstemious in this respect.

Hypochondriasis is not in reality confined to the better classes of society, or to persons of cultivated minds, on whom moral causes may be supposed to act with the most extensive influence. Cases occur frequently in hospitals, and therefore among the lower orders. The writer of the present article has had under his care, or at least under his occasional observation upwards of twenty years, two patients of this description who are among the most ignorant of the lower class of peasants. They both furnish strongly-marked examples of hypochondriasis; both have been tormented during a great part of the space above mentioned by the numerous and frequently varying but ideal miseries which accompany that disease. In both of these persons the nervous system appears to have been originally weak and susceptible of impressions; but the causes which actually gave rise to morbid phenomena in their constitutions could scarcely belong to the class of moral agents: they were circumstances which induced disorder in the physical or natural functions. The same conclusion may be drawn with great probability in most of those instances of hypochondriasis which occur among persons of the lower classes.

We may state in a summary manner that the causes which occasion hypochondriasis as an idiopathic complaint, are agents which exercise an hurtful influence on the mind, and through it on the nervous system: too intent and long-continued application; studies and professions which require great intellectual exertion; anxiety respecting the success of schemes and prospects of worldly advancement; disappointment of various kinds, and consequent dejection; and lastly, though this is by no means the least important article in the catalogue, the indulgence of vicious habits which tend to debilitate the mind and body. The noxious influence of these causes is exerted in the first place on the nervous system; the functions of physical life are affected by sympathy; nor are such affections difficult to understand or to reduce to the general analogy of facts in pathology; but this is a consideration which belongs to the next section.

There are very many instances of hypochondriasis in which, as we have before suggested, the predisposing causes are those which give rise in the first place to dyspeptic ailments, and to disordered actions of various kinds in the alimentary canal. Sedentary habits, a poor diet, the abundant use of warm diluent fluids, tea, coffee, and the like, a constipated state of the bowels subsisting habitually and long continued, are the most frequent of the causes reducible to this class. The disease appears to be more common among the lower ranks of society in this country than in France, and that, if we are not mistaken, is particularly the case with respect to women. A great number of the wives of cottagers, and old women who live with their own families, and not in domestic service, are fed in England chiefly on bread and tea, seldom getting either much animal food or any fermented liquors. Of these a considerable proportion are dyspeptic, and many are hypochondriacal.

Pathology. — Anatomical researches have thrown no light on the pathology of hypochondriasis, nor does it appear probable that the subject will ever be elucidated by such means. Organic changes of almost every description have been discovered in the bodies of persons who have been the subjects of this malady. Their diversity is too great to allow of the supposition that they are all connected with one complaint. The individuals in whose bodies they have been discovered have terminated their existence under various diseases. Hence the diversity of morbid phenomena, which, if it were possible to trace the connection of causes and effects, would probably be found to have stood in no near relation to the hypochondriachal ailments which affected the individuals in question without endangering life, or ultimately accelerating its termination.

Medical writers have long been divided in their opinions with respect to the seat and nature of hypochondriasis. Some have regarded it as a primary disease of the nervous system in general, or of the brain itself; while others have looked upon the affections of the nervous system as secondary, and depending upon sympathy with a disordered state of functions belonging to the abdominal viscera. These opposite opinions were espoused by Sydenham and Hoffmann, and each of them has found advocates among distinguished writers of the present time.

Sydenham, as we have before observed, considered hypochondriasis and hysteria as closely analagous, or rather as modifications of the same disease, depending merely upon sex. He says, that "the disturbed or variable disposition both of mind and body which prevails in hysteric and hypochondriac subjects arises from a disorder of the animal spirits, or from an inordinate motion of the spirits."—"The spirits," he says, "which are subservient to the mind are, in reality, composed of the finest particles of matter, and border upon immaterial or spiritual beings." Sydenham's expression, "a *disorder* of the animal spirits," translated into the medical phraseology which is current in our own times, is well known to mean a disordered state in the functions of the nervous system. In connection with this opinion as to the nature of the disorder, the author remarks that it occurs to those whose minds, or rather whose nervous systems were "originally weak or have been rendered so by a long train of disorders, or their long continuance."

Hoffmann maintained the opinion that hypochondriacal maladies proceed originally from disorders of the stomach and intestinal canal, from irregularities in its peristaltic action, whence ensue dyspepsia, flatulence, colic pains, spasms, and all the local symptoms which gave to the disease the name of hypochondriasis. The general disorders of the nervous system are supposed by this writer to depend on sympathy.

The opinion which ascribes to hypochondriasis a local origin has been reduced to a more definite form by modern writers. M. Louyer Villermay, in his treatise on nervous diseases, maintains that the primary seat of the complaint is in the abdominal viscera, and especially in the stomach. Here, according to Villermay and many who have adopted his opinion, the disease consists in a morbid state of the nervous structure and of the vital properties of the parts, and chiefly in an excess of their organic sensibility, an expression which belongs to the school of Bichat. The disorders which affect other organs and nearly the whole animal economy in hypochondriasis, are the results of sympathy with the morbid condition of the nervous structure connected with the gastric system.

M. Broussais and his followers modify this theory according to their peculiar and favourite doctrines. The disease, according to M. Broussais, is seated primarily in the coats of the stomach, but it is not a merely nervous affection. It is the same state, or analagous to the same morbid state, from which so many other manifestations of disease in various parts of the system arise; namely, a chronic inflammation of the mucous membrane of the stomach. From the peculiar condition of this membrane with respect to its vascularity, arises its morbid sensibility, and from sympathy of other parts of the system ensue all the multiform phenomena of hypochondriasis.

M. Georget has strongly opposed the opinion of those who place the primitive seat of hypochondriasis in the abdominal viscera. In his work entitled "*Physiologie et Maladies du Système Nerveux,*" he has investigated this subject, and has deduced from his own observations, and from facts reported by various authors, the following inferences:—

1st, That the characteristic phenomena of this disease refer themselves to the head. 2dly, That the other symptoms which sometimes belong to cases of hypchondriasis are not constant: thus we find that there are some cases in which palpitation of the heart has been remarked; there are others in which no remarkable derangement in the digestive processes has been observed. 3dly, That almost all the exciting causes of the disease are such as are known to exert their influence directly on the cerebral functions. 4thly, That the most efficacious methods of treatment are moral remedies. From these considerations the author has drawn the conclusion that hypochondriasis is a primary affection of the brain.

It is impossible to give due attention to the arguments adduced by M. Georget on this subject without being aware that they have considerable weight. And yet the inference seems rather strongly drawn when we advert to the fact admitted on all hands, that no disease whatever has been traced with certainty in the brains of hypochondriacs. It must be taken into the account that morbific causes may, and do occasionally, act through the intervention of the brain, and induce disorders in other parts of the system much more real and considerable than the derangement occasioned, *in transitu*, in the brain. A man may receive some afflicting intelligence just before he is going to dinner, which may so spoil his appetite that he cannot eat. The function of the stomach is here impeded and deranged; not so that of the brain, although the impression is undoubtedly communicated through the instrumentality of the brain. In like manner trains of morbid causes may bring on repeated and at length habitual derangement in the functions of the alimentary canal, and of all the parts connected with it in structure and operation. These causes act through the instrumentality of the brain, but they are not productive of actual disease in the structure at least of that organ.

These considerations throw light on some of the theoretical questions connected with hypochondriasis. They tend to explain, so far as the analogy of facts occurring in the animal economy affords explanation, the circumstance that disorders in the natural functions, and particularly in those of digestion, arise from causes acting on the nervous system, and this without necessarily involving the supposition that there is disease actually seated in the brain and nervous system. The consideration that hypochondriasis is a disorder frequently, perhaps chiefly in its most aggravated forms, arising from the influence of causes which act, in the first place, upon the mind and on the brain, is therefore no adequate proof that the brain is disordered. The condition of the sensitive and intellectual powers, which are uninjured in this disease, seems to afford a presumption on the negative side of the question. Still, when we take into the account the mental dejection of hypochondriacs, the habitual state of their spirits, and the trains of morbid feelings, of painful sensations which torment them, we can scarcely refuse to admit that some unknown deviation from the healthy and natural state of the cerebral functions lies at the foundation of their ailments, though it is remote from organic disease, and of a kind of which we can form no conception. Many of the phenomena which accompany this disorder would lead to the opinion that the principal deviation from health and the natural state of functions is situated in some other part of the nervous fabric rather than in the brain. They might be thought referable to the system of ganglions in connection with the great sympathetic, or to what has been termed the nervous system of the viscera or of physical or organic life; since in this is the immediate centre, as it appears probable, of that peculiar property or influence termed organic sensibility in the stomach and other abdominal viscera. But phenomena involving consciousness and affections of the mind can hardly be confined to this part of the nervous system; the brain must participate in the morbid disposition; unless we could persuade ourselves to believe, with Bichat, that the feelings or pathemata have their proper seat in the ganglionic apparatus.

We shall close this part of our subject by adverting to a circumstance which confirms the conclusion that hypochondriasis is a disease of the nervous system rather than of the digestive organs themselves. It is the fact that the complaint is in some instances suspended through long intervals of time, during which the individual subject to it is in perfect health. We have known hypochondriasis to attack the same person several times during his life. A gentleman, previously healthy, active, and vigorous in mind and body, temperate, and regular in all his habits, became, without any assignable cause, low-spirited, anxious about his health, fancying that he was in imminent danger of various diseases of which he could trace slight and evanescent symptoms in his own feelings. He then began to complain of indescribable sensations about the stomach, burning pains in the epigastrium, flatulence, sinking, internal weakness; of pressure on the brain, and various symptoms of distress referable to the head; in short, of nearly the whole train of symptoms which characterize the most complete examples of hypochondriasis. These complaints molested the unfortunate sufferer for several months: no remedies appeared to be of any service. At length the symptoms disappeared, and he regained perfect health, which he enjoyed for an interval of several years. During this period he bore no trace of any disease in the digestive organs. On the contrary, all the functions of physical life went on in a perfectly regular way. The attacks of his disease have recurred several times, and with the depression of spirits all the dyspeptic symptoms returned. It might, indeed, here be a question, whether the return of gastric and enteric disorder brought with it the recurrence of nervous symptoms, or, conversely, whether the relapse into disease of the nervous system was the occasion of renewed dyspepsia. The latter supposition is by far the most probable. Habitual disorders of the digestive functions are not frequently observed thus to cease altogether, and to recur without any distinct and perceptible causes. They do not leave their victim for some years in a state of perfect immunity from their influence, and attack him again in renewed and distant periods, while this is conspicuously the case with complaints affecting the brain and nerves: cases like that which we have described seem to approximate hypochondriasis to the class of disorders affecting primarily the nervous structure. They are incompatible with the supposition that chronic disturbance of the alimentary canal constitutes the whole essence of the disease.

But although it seems to be sufficiently evident that the actual seat of hypochondriasis, or the part of the organized fabric on the disordered state of which its characteristic symptoms depend, is the brain and nervous system, yet it cannot be doubted, on a consideration of the predisposing causes, that the latter in some cases exert their primary influence on the state of the abdominal viscera. Severe and long-continued disorder of the digestive organs lays the foundation for hypochondriasis; as similar influences occasion other diseases of the nervous system. As long as the mind is unaffected, the complaint may be considered as simple dyspepsia, and the whole of the disease may be regarded as confined to the digestive organs; but when low spirits and dejection are manifested, and hypochondriasis properly so termed exists, the disease must be supposed to have involved the nervous system, and in some degree the brain.

Treatment.—The treatment of hypochondriasis would be easy and probably in most instances successful, if it was taken up on rational principles from the commencement of the disease or early in its course. This seldom happens to be the case. It is rarely that hypochondriacal patients apply for the advice of a physician until the failure of a variety of remedies administered by themselves drives them to seek for aid likely to be more available. When such an application is made, it is generally found that the patient has been a great reader of medical books; that he has repeatedly experienced in his own person the effects of every specific drug reputed to restore the functions of the liver and the chylopoietic system. It will often be found impossible to prescribe any remedy which has not already been tried, and given up in despair. Under such circumstances, the wisest course a physician could pursue, would be to repeat the precept of Montanus, often cited with applause, "Fuge medicos et medicamenta, facileque convalesces."

The treatment of hypochondriasis should be divided into two departments, the dietetical or moral, and the pharmaceutical. Of these the former is by far the more important, whether in recent or inveterate cases.

The first indication which common sense points out for the relief or cure of hypochondriasis, and the beneficial tendency of which is confirmed by experience, is to remove the causes of the disease by laying aside the habits, and as far as possible reversing the moral influences which have occasioned it. Change of scene, a removal from customary occupations by travelling, is the best method of ensuring this object. In the good old times, when physicians had a double hold on the obedience of their patients, the monkish practitioners had an excellent resource in prescribing for hypochondriacs a pilgrimage to the tomb of St. Jago, or the shrine of the Three Kings: but when their patients had lost all faith in the relics of Melchior, it became necessary to substitute other expedients which are not always quite so innocent. The most popular of these has been a resort to mineral springs; Hoffmann extols the waters of Schwalbach and Pyrmont. Various medicinal springs have afforded a pretext for advising sick persons to remove from home, and out of the influence of circumstances which created and fostered their disease. The physician who has hypochondriac persons under his care will avail himself of those means for fulfilling the indication above suggested, which may best accord with the circumstances and the prejudices of his patients. Continued travelling has the best effect, and is on many accounts preferable to an abode in any one place. Even the accidents of diet and lodging to which travellers are exposed are often productive of benefit to patients of this class: and when such circumstances produce temporary disorders of a different kind, as rheumatism, colds, slight bowel complaints, minor evils of this description are found to take off the attention of the patient from his habitual malady, and even tend to introduce, when they begin to abate, a better state of health and spirits. A gentleman who had been for many months labouring under great nervous susceptibility, dyspeptic, and unable to take food without producing great excitement and distress, set out in this state to make a journey in the south of Europe. He was seized on his way with diarrhœa, which was kept up by the acid cookery and wines of France, and continued for some weeks. Instead of increasing his principal malady, these accidents materially lessened it, and even before the new disorder entirely ceased, all the old series of complaints, both of the digestive functions and the spirits, were in a great measure cured.

As the effect of remedies in these instances depends not less on their influence on the mind than on the body, patients should be advised to go to places where their attention is likely to be occupied; this must be determined by circumstances.

Habitual and regular exercise is very conducive to recovery from hypochondriasis. Sydenham says, "the best thing I have hitherto found for strengthening and cheering the spirits is riding on horseback some hours every day." He gives an instance of the efficiency of this remedy, in a "learned and reverend prelate, who, having applied himself too intensely to his studies for a long time, was at length attacked by a hypochondriac disorder which destroyed his digestion." After trying various remedies in vain, when reduced to great weakness by a colliquative looseness, he at length consulted Sydenham, who "immediately judged that it would be useless to order any more medicines as he had taken so many already, and, therefore, advised riding on horseback, directing him to take only such short journeys at first as he could bear without fatigue." "I entreated him," says Sydenham, "to continue it every day, to lengthen his journeys by degrees, and not to mind either meat, or drink, or the weather, and to take up with such accommodations as he met with on the road like a traveller. In short, he continued this method, till at length he rode twenty or thirty miles a day, and finding himself mended in a few days, he was encouraged by this wonderful success to continue in the same course for several months, in which space of time he rode several thousand miles. He was at length not only freed from his disorder, but became strong and brisk."

When the patient cannot ride on horseback, some other mode of exercise must be substituted. Walking is the most advisable, if the strength admits of it. Even females, when labouring under hypochondriasis, have derived great benefit from the practice of walking several miles every day, and by constantly observing the rule to do so when not prevented by intemperate weather.

The most effectual, however, of all rules for the cure of hypochondriacal patients is to withdraw them from studies, or pursuits, or habits of whatever kind, which may have been connected with the formation and development of their disease. If this maxim cannot be fully acted upon, which will unfortunately happen in a great number of instances, it must ever be borne in mind, and followed to the utmost limit which the circumstances of the invalid will admit. In all cases it must be remembered that much depends upon keeping the mind as much as possible agreeably and actively engaged. Irreparable evils may ensue from allowing the patient to sink into a state of mental vacancy and despondency, and to brood on his own uncomfortable feelings.

Something may be contributed towards the cure of hypochondriasis in many instances, and perhaps in all towards its mitigation and the relief of symptoms by medicinal remedies. The choice and mode of administering these must depend upon the state of gastric and intestinal disorder with which the other ailments of the system are complicated. It will be well to bear in mind Broussais's theory of the disease, which is not without foundation in truth. If gastro-enteritis, or an inflamed or highly irritable state of the mucous membrane exists, of which there are frequently indications more or less strongly marked, the case must be treated accordingly. All stimulating remedies will then be improper, and the regimen most likely to prove beneficial will be the antiphlogistic. An attenuating diet, with semi-fluid farinaceous nutriment and cool drinks, the use of mild injections and the most gentle laxatives for the purpose of regulating the bowels, the occasional application of leeches to the abdomen, warm bathing, will be the principal means of relief. When the dyspeptic maladies are without any inflammatory combination, and allied to atony or want of strength and action in the alimentary canal, warm purgatives, combined with bitters, aromatics, and the drugs termed antispasmodic or nervine, are most serviceable. Rhubarb, or infusion of senna and gentian, with some aromatic tincture, may be given daily or occasionally; with them alkaline or neutral salts may be combined according to circumstances. Aloetics, and compounds containing other resinous purgatives, may be added if necessary, and combined with assafœtida or the galbanum pill. The remedy which agrees with the greatest number of flatulent and dyspeptic persons for the longest period is composed of a drachm of powdered rhubarb in a half pint of warm peppermint water.

Tonic remedies are used with advantage in some cases of hypochondriasis; and of the class of drugs so termed, the sulphate of quinia and the sulphate or subcarbonate of iron are the most efficacious. The subnitrate of bismuth may almost be considered as the sole remedy of the kind in cases attended with gastralgia after eating, and with pyrosis. It may, perhaps, be superfluous to observe that all the remedies of this class are highly injurious in cases attended with a state of the intestinal canal bordering on gastro-enteritis.

J. C. PRICHARD.

HYSTERIA.—Hysteria is a name commonly given to certain paroxysms of disorder occurring in peculiar constitutions, and generally in females; but in its full signification comprehends several peculiarities of a permanent character, as well as peculiar phenomena of occasional occurrence not amounting to the hysteric paroxysm. The latter phenomena sometimes appear singly, and sometimes in connection with morbid actions not hysterical, but to which they impart a peculiar or hysteric modification. Thus defined, and the definition will be found of practical application, we may almost admit without qualification the remark of Sydenham, that hysterical disorders constitute one-half of all chronic distempers.

The circumstances of the hysteric paroxysm may in part be described from observation; but some of them are only perceived by the individual affected. Of the latter kind is the sensation of a ball or solid body suddenly perceived in some part of the abdomen, and usually in the left iliac region, or in a situation corresponding to that of the sigmoid flexure of the colon. It is probable that accurate observation would detect a circumscribed swelling or fulness in that situation when the sensation comes on; but, both on account of the short duration of the symptom, and for other reasons easy to be imagined, this fact is generally taken on the testimony of the patient. A kind of vermicular motion of the abdominal muscles, and the sudden elevation and depression of the abdominal surface have been observed. There are, also, some precursory symptoms which are very troublesome to the patient, but not very easily described, concurring to produce what is called a *general* uneasiness and oppression; together with the more distinct symptoms of stiffness about the larynx, headach, and cramps. M. Georget says that the hysteric patients in the hospital of the Salpêtrière are so well accustomed to take warning by these precursory symptoms as never to be seized unexpectedly: they go to bed, and are tied down until the fit is over.

The sensation of the ball or globus, is described as ascending to the stomach, and then up the chest to the neck, becoming fixed in the throat; and to this sensation physicians have given the name of *globus hystericus*. In some persons who are liable to it on particular occasions, and in others who are occasionally affected with violent hysteria, the paroxysms of hysteria may end here. But in many, whilst the sensation itself is very distressing, it is attended with a sense of coldness and stiffness in the legs or in the trunk of the body, a depression of spirits, noise in the ears, and vertigo; and to these symptoms succeeds a temporary loss of sense and consciousness, and of command over the muscles of voluntary motion, which are either motionless, or violently and involuntarily agitated; the arms and legs being most generally affected, in short but repeated paroxysms, with vehement struggles, during which one of the hands is frequently struck on the breast, or the head lifted up and struck violently against the bed or the floor, or the patients tear their hair or otherwise injure themselves. Whilst these attacks last, the action of the heart is generally vehement, subsiding at intervals, but becoming again excited when a new paroxysm is coming on: the carotids are seen to beat strongly, and the veins in the neck swell. The face is flushed, and the skin is hot. The muscles of respiration are in almost every case especially affected; the patient breathes slowly, deeply, and as if by sudden impulses; or sighs profoundly, or sobs heavily, or cries or laughs immoderately and without meaning. Violent expiratory efforts are made, seemingly opposed by spasmodic action of the glottis;* the hands are forcibly applied to the throat, as if the patient felt a painful spasm there, and suffocation was impending: sometimes the epigastrium seems to be the seat of intense suffering, and is rubbed or even violently struck by the patient. Some patients bite their hands or arms, or those of the unguarded bystanders. Occasionally, the bladder is affected with irregular action, and pale urine is copiously ejected.

Of a paroxysm of this kind the duration is uncertain; varying from a quarter of an hour to several hours. The recovery from it is often sudden and complete; a flood of tears, a burst of laughter, or a cry like that of one suddenly awakened, frequently ends it; or the patient, apparently exhausted, sinks into a state of quietude from which the recovery may be either sudden or gradual. The patient is sometimes unconscious of what has been going on around her, but is not unfrequently able to repeat what has been said by the assistants during the fit; a circumstance which not only suggests certain cautions to the practitioner, but has been made use of in the cure of this troublesome malady.

After such an attack, there is in some instances a temporary impairment or loss of voice, or of some of the muscles of voluntary or involuntary motion, as a paralysis of the arm, or of the bladder. In general, the only consequences are a degree of fatigue, and headach.

Such is the common form of the hysteric paroxysm; but it is subject to varieties, the distinction of which is on some occasions extremely important to the medical attendant, as well as to the patient. "This disease," says Sydenham, whose description of it is very minute and accurate, "is not more remarkable for its frequency than for the numerous forms under which it appears, resembling most of the distempers wherewith mankind are afflicted. For in whatever part of the body it be seated, it immediately produces such symptoms as are peculiar thereto; so that unless a physician be a person of judgment and penetration, he will be mistaken, and suppose such symptoms to arise from some essential disease of this or that particular part, and not from the hysteric passion." (Swan's Translation, Lond. 1749, p. 370.) Unusual forms of sudden illness, or unexpected circumstances in the course of disorders familiar to the observers, often excite much alarm until their hysterical character and origin are recognised.—Every form of hysteria, however various and transient, is, therefore, sufficiently important to deserve the attentive observation of the student of medicine: nothing else can lead to their ready recognition in future practice, where a mistake may prolong needless anxieties, and be even of serious consequence both to the practitioner and patient; affecting the safety of one and the reputation for discernment of the other.

The ordinary varieties of the hysteric paroxysm chiefly consist of certain limitations of the preceding phenomena, with more or less aggravation of their severity in the parts or functions which happen in each case to be their seat. In many cases the symptom of globus, commencing in the abdomen, is accompanied with an incredible development of air in the intestines, which produces great distension and oppression, induces dyspnœa, various pains both in the abdomen and chest, and a sense of constriction in the throat, with irregular breathing or crying; but does not go on to convulsions of the voluntary muscles, nor to insensibility and complete loss of power. These attacks come on, perhaps, a few hours after dinner, and last for two or three hours: an immense quantity of air is at length got rid of by eructation, and then all the symptoms subside. If the eructation does not take place, the patient complains of severe anguish in the situation of the stomach; or, becoming too much oppressed to speak, rubs the epigastrium vehemently with her hand. There is evident distension of the upper part of the abdomen, which may, without eructation, gradually subside; and there is often great commotion in the greater part of the intestinal track, productive of violent rumbling, sometimes with alternate protrusion and subsidence of different portions of the abdominal parietes. But whilst the distension remains, other symptoms may supervene, apparently excited by it; as disturbance of the circulation in the form of palpitation; determination of blood to the head, producing severe pain, sometimes with vertigo, flushing of the face, suffusion of the eyes, and some degree of mental oppression or torpor; all of which seem in certain cases to be secondary to the gastro-intestinal distension or tympany. To these symptoms, or to a part of them, succeed in other patients all the other circumstances of the hysteric fit; the muscular agitation, the loss of the sensorial and muscular power, and the consequences of these accidents.

Certain obstinate cases of indigestion in females are in reality hysterical. The patients complain of much oppression after eating; the oppression sometimes amounts to temporary stupor, with a feeling of inability to move, which yields, however, to strong efforts or excitement; occasionally true hysteric symptoms, globus, disturbed breathing, convulsions, and insensibility, succeed, and even in the lighter forms give relief.

The irritability and disorder of the stomach in hysterical subjects is in some cases manifested by the occurrence of vomiting; the matter vomited being green or black, and like the grounds of coffee. (*Whytt.*) We have never known hæmatemesis occur in the fit, as mentioned by Georget. The appetite is very irregular, often craving things hurtful, and at hurtful hours, as meat, cheese, cucumber, &c., at night, and then only. Great depression of spirits is generally conjoined with these states of gastric disorder, and proneness to tears.

As no organs of the body sympathize more with the nervous system under the various impressions made upon it than those concerned in the function of respiration, so the hysteric constitution is particularly liable to disturbances of this function

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* Emphysema has sometimes ensued; supposed to proceed from the air being forced through the cellular tissue and mediastinum. See the article EMPHYSEMA in this volume, p. 13.

The intense susceptibility of such a constitution leads to the occurrence of hurried breathing when even slight emotions are experienced; and to sighing, sobbing, and violent inspiration and expiration when any of a more powerful kind are excited. There are patients in whom hysteria manifests itself chiefly by these irregularities, which are more or less induced in different individuals; in some very readily, being in them only transient in their existence; in others with more difficulty, and, when produced, evincing more violence and less facility of being controlled. The irregularity of breathing, occurring in paroxysms, and induced by accident, sometimes very closely simulates asthma; and this solution of paroxysms apparently asthmatic may be sought for with success when they occur in young persons rather than in older, and in females of an irritable temperament: the apparent asthma will often be found co-existent with other and less doubtful hysterical phenomena, and will admit of considerable or of permanent relief from what are called anti-hysteric remedies.

A loud, disturbing, dry cough, almost resembling a bark, is so peculiar to hysteria that it might well be called the hysteric cough. It occurs in paroxysms, and is brought on with much violence by slight mental impressions, as by an unexpected visit from a friend, or the approach of the medical practitioner. Individuals thus affected are commonly subject to all the other symptoms of hysteria. In some patients the hysterical attack comes on with an apparent spasm of the glottis, and a croupal respiration; in others it assumes the form of common asthma. Dr. Ferrier speaks of an hysterical hemoptysis, relieved on the supervention of the fit; but this, and the copious expectoration with profuse night-sweats, described by most of the older authors among the troubles of hysteria, we have not observed.

We were not long since in attendance on a patient of about thirty-five years of age, in whom there was a deficient, although regular, performance of the uterine functions, and in whom at each monthly period there was sudden suppressio mensium *following* the appearance of what the patient called her asthmatic complaint; of which, however, the symptoms were not those of regular asthma. They occurred at such times, and for a week or two afterwards, every other day, commencing with great coldness of the hands and feet, and headach; to which succeeded a peculiar difficulty of breathing, lasting all the day, and going off at night. The breath was not, in these attacks, as in asthma, suddenly drawn in and protractedly and sonorously expired, but the inspirations and expirations were short and panting, about forty inspirations being made in a minute; the pulse at the same time being very low and weak, and not more than *twenty* in a minute. There was a sense of weight amounting to pain, in the sternum; pain in the region of the heart and between the scapulæ; and fulness and pain in the head; the face was flushed, and the eyes were protruded; a thick expectoration was described as sometimes inducing relief. We mention this case, however, chiefly because the symptoms of failing pulse, coldness and orthopnœa, often led the friends of the patient to think that she was dying; and yet the complaint has now for several months entirely disappeared under treatment calculated to improve the general health, to regulate the uterine functions, and to allay the great susceptibility of the nervous system. We were informed that in two or three members of the patient's family consumption had supervened on similar symptoms; but all medical men are aware of the doubtful nature of this kind of evidence.

In no class of patients is an irregular pulse more frequently observed: when it is first felt, it is perhaps found to be very rapid; after ten or twelve beats this quickness subsides, but soon comes on again; and these alternations appear to be continual. Slight causes produce a more permanent excitement, during which the practitioner may be much misled; in a few days the excitement will be gone, and the pulse will be found languid and weak. If these caprices of the circulation are embarrassing when no serious disease is present, they become much more so in affections themselves important, as in acute inflammations, or in the commencement or course of continued fevers. Among the many modifications of the ordinary symptoms of fever by the hysterical constitution, we have remarked a singular inequality between the arterial pulsations and the respiration; the pulse being sometimes as slow as the ordinary respiration, and the respirations sometimes advanced to the ordinary rapidity of the pulse. These circumstances seem most common during the first three or four days of the complaint, and, occurring in any other than hysterical patients, would furnish ground for a very unpromising prognosis.

It is seldom that the hysterical respiration is unaccompanied with irregular or with hurried and vehement action of the heart; and it is particularly important to remember that an irregular as well as a very frequent pulse may be occasioned by many causes in an hysteric patient; by temporary causes, and by diseases unconnected with the structural affection of the heart. We have known delicate females, during convalescence from a fever, repeatedly bled for palpitation really dependent on weakness, to the lasting impairment of a constitution already morbidly susceptible. It is to be said, however, that mere hysterical palpitation is occasionally attended with so much disturbance in the impulse as well as in the rhythm of the heart, as to make its resemblance to structural alteration of the organ such as even the stethoscope fails at once to disprove: the practitioner's chief assistance in the diagnosis of such cases must arise from his observation of the transient and occasional character of the symptoms, and from his knowledge of the patient's constitution.

The pulsations of the aorta are also in some hysterical cases greatly disturbed, principally as regards their force, which becomes so much increased that the patient complains much of the beating in the abdomen, and the practitioner himself is harassed with the fear of organic disease. In the course of fevers we have found this affection existing in a very remarkable degree, generally together with other irregular symptoms; and the pulsation has been so vehement, and within a space so circumscribed, as very precisely to convey to the hand the sensation of a large, defined, pulsating tumour.

In different individuals, and in the same individual in different attacks, the disorder to which the name of hysteria seems justly given, (because such individuals always show more or less of the hysteric character, and their various affections are more or less obedient to what may be called antihysterical remedies,) assumes shapes so various that it would be in vain to attempt to describe them all. There seems to be no function or organ in which irregularity may not be induced in an hysterical constitution; the irregularity occurring, and disappearing, or being overcome, with so much suddenness as to create a perfect analogy between such affections and the commonest forms of the disorder.

Thus in some cases the hysteric fit consists of temporary and partial loss of power, or a palsy of some of the voluntary muscles; sometimes of those of one limb; sometimes of those of the voice; and sometimes of all the voluntary muscles of the body, and the patient falls into a state of coma; is insensible; the face is flushed; the pulse beats regularly, even firmly; the respiration is calm and profound; and neither the sensibility nor the power of voluntary movement return for several hours. These cases somewhat resemble apoplexy, and cases are on record in which they have gone on to it: generally, however, they do not require active treatment. In the first case of this kind which we ourselves witnessed, a young woman fell down in the street, and we were at a loss to account for what seemed to us the rash prophecy of an experienced physican that she would recover in a few hours. These cases are mentioned by Whytt.* "Many hysteric women," he says, "are liable to be seized with faintings, during which they lie as in a deep sleep; only their respiration is so low as scarce to be perceived. Others, along with faintings of this kind, are affected with catchings and strong convulsions." A similar state may succeed to the more violent phenomena of hysteria; (*Louyer Villermay*, Traité des Maladies Nerveuses ou Vapeurs, &c. Paris, 1816,) and the functions of the heart and lungs may be so seemingly suspended, and the coldness so great, as to present the image of death. Pliny has recorded a case in which this state lasted seven days; and Lancisi mentions one in which a young woman recovered whilst the funeral service was performing. A more striking case occurred to Vesalius, who began to dissect a supposed dead body, to which life returned with the first application of his scalpel. Of the same kind, probably, was the case of a Lady Russell, in the early part of the last century, whose funeral having been postponed for a longer period than usual, afforded time for her happy recovery, which took place while the bells were ringing for prayers; the supposed dead person exclaiming that it was time to go to church. Cases of this kind constitute M. Louyer Villermay's *third* degree of hysteria. (Dict. de Méd. Article *Hystérie*.) We see no shadow of reason for applying to them the name of hypochondriasis, as some have done, (*Hoffmann*): perhaps they would be more properly classed under the head of syncope.

Instead of these comatose forms, there may be rigid spasm of several of the muscles, especially of the limbs; the legs and arms may be stretched out, the fingers strongly compressed on the palms, and the toes as strongly drawn up. This state may be varied by an occasional start, accompanied with a short and forcible expiration, and at length give way instantaneously, often to proper remedial means. The spasmodic state is described by credible authorities as having in some cases lasted for several weeks.

That a disorder capable of producing so many irregularities of function should occasionally produce a counterfeit representation of various maladies, and should singularly modify the course of others, is not surprising; but the deception is not limited to functional affections, being often extended to the imitation of organic changes. Diseases of the stomach, of the liver, of the intestines, of the bladder, and also of the heart, the lungs, and the brain, have thus been supposed to exist.

Some of the inconveniences which, in hysterical patients, are to be referred to a depraved state of the stomach and bowels, with great distension, have already been mentioned. It is to be added that prolonged constipation, continuing even for weeks, and sometimes the opposite state of obstinate purging, occur in such cases.

Hysterical women will complain of symptoms of obstruction of the gullet, of the rectum, and even of the vagina: and the urinary system is in them much and variously affected. Spurious symptoms of calculus in the kidney, the ureters, or the bladder, may arise and be of little consequence: dysuria, or even a suppression of urine may occur; but more frequently, as in other instances of nervous disturbance, there is an unusual flow of it, and sometimes a kind of false diabetes. These circumstances make such patients an easy prey to quacks and pretenders in medicine, by whom we have known them to be persuaded of the real existence of scirrhous formations, or other serious diseases with which they were not in reality affected.

Jaundice has supervened, in some cases, on hysteria. We have known pale and feeble women who were liable to acute and apparently spasmodic pain in the situation of the liver, and in a situation corresponding to the course of the ureter: these cases were connected with uterine irritation, and had been vainly subjected to various remedies administered for biliary and for renal disorder. Such cases are among the many in which bleeding and purging, and salivation, the ready instruments of coarse and indiscriminate practitioners, are daily productive of irreparable mischief.

Pains, of variable severity, often very severe, are among the distresses of the hysterical. A fixed pain in the forehead, and generally over one eye, which has been termed *clavus hystericus*, the sensation being that of a nail driven into the forehead, is very common. It is one of the many attendants of uterine irritation, to which, however, hysterical affections have been too exclusively attributed: we have known it disappear entirely during pregnancy, and again become troublesome a few months after delivery; and it is generally preceded by a sense of weight in the head, and an oppression in the throat; and is sometimes relieved by a flow of tears.

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* Observations on the Nature, Causes, and Cure of those Disorders which have been commonly called Nervous, Hypochondriac, or Hysteric, Edinb. 1765. Pages 64 and 86.

More severe and general invasion of pain in the head may come on, with much of the character of phrenitis; with senses morbidly acute, and small and rapid pulse; but without acute delirium, or red and injected eyes: the face also is very pale, and there is much hysterical agitation.

There is another painful affection, often also, we believe, connected with irregularity in the uterine functions, and attended with constipated bowels, in which the patient's chief suffering is fixed in the left side, below the mamma, and above the situation of the spleen. There is most acute tenderness without swelling; the patient cannot lie on the affected side; and the disease resists for months, sometimes for years, all varieties of treatment. Although we have said that these cases are often connected with uterine irritation, the depraved state of the appetite, occasional sickness, and obstinate sluggishness of the bowels, make us doubt the propriety of laying great stress on the uterine disorder. In these cases, or in most of them, there is some pain of the back, referred to the lowest part; and there is a tenderness of the spine, confined to the dorsal region. The pain of the sacrum is a common complaint with females in whom the uterus is unhealthy, and yet who are not hysterical, and who have no tenderness about the dorsal vertebræ; and neither the dorsal tenderness nor the sacral pain is present in many of the examples of the clavus hystericus, even when most clearly arising from uterine irritation. These circumstances, which we have very carefully verified, are incompatible with the uterine theory of diseases which we shall have to notice when speaking of the *causes* of hysteria.

The female breast is in some hysterical cases the seat of much pain, and is also enlarged and hard; so that the patient dreads the occurrrence of cancer, although at an age when the practitioner has no apprehension of it. Dr. Darwall mentions a case, in his remarks on spinal irritation, where this was combined with tenderness of the three superior dorsal vertebræ, and all the symptoms were relieved by cupping. Pains of the limbs are not unusual, and they are now and then united with an impairment of the motions of the hip or the knee, leading to a suspicion of disease of the joints. In very young but precocious females we have seen this curious complaint combined with strange affections of the sight and of the voice; of which one of the most remarkable instances that we remember occurred some years ago in the Edinburgh Infirmary: the subject of it was a girl of thirteen, and the lameness and partial blindness, and an appearance of fatuity, all disappeared under a steady application of Dr. Hamilton's purgative treatment.

Sudden and violent attacks of pain in the abdomen, with excessive tenderness of the surface, a quick pulse, and many symptoms which may be mistaken for those of peritonitis, sometimes take place in hysterical young women, yet without inflammation. It is to be observed that the tenderness, in all cases of hysterical pain, is most felt on slight pressure, and is often evinced on the gentlest touch; which is not commonly seen in instances of internal inflammation.

The most severe examples of colica which we have met with have been in hysterical women; cases of excruciating pain, not yielding entirely for many days, during a great part of which time the cries of the patient have disturbed the whole house. These cases have been denominated flatulent or hysteric colic. In these cases, if the extreme tenderness on slight pressure is present, firm pressure is borne much better, and perhaps gives relief: the tongue is often clean, or has not the whiteness so general in enteritis; there are also intervals of relief from suffering, during which the patient's voice is calm, and the pulse not much quickened, or is sometimes slower than usual, without any sharpness, and even very low. Such attacks are often relieved by the dejection of copious, dark-coloured, and offensive stools.

Inequality in the regulation of the animal temperature is another troublesome part of hysteria. Fits of coldness and of oppressive heat succeed each other; or the feet are cold and insensible to the hottest fire or to very hot water, whilst the head and face are burning, in which case there is commonly some delirium. A feeling of coldness running down the spine, which is familiar to nervous persons, is often present in the hysterical.

We cannot call to our mind an hysterical patient whose sleep was generally tranquil and undisturbed: many have complained of prolonged and distressing wakefulness, their nights being often passed in a state of perfect vigilia, and at other times rendered uncomfortable by restlessness and distressing dreams. Yet it has always appeared to us as remarkable, that, unlike epilepsy, the hysteric attack does not usually come on in the night, or after sleep.

Many pages might be filled with accounts of singular forms of disease, productive, according to the degree of information possessed by the attendants, of more or less wonder and perplexity, which have been observed in all ages, and which might justly be classed with hysteria. From the irritations occasioning mere restlessness, yawning, and what are called "the fidgets," up to the most capricious and violent disturbance of different parts of the system, there seems to be nothing strange or odd which hysteria has not at times exhibited. Among these curious phenomena may be mentioned a disposition on the part of the patient to repeat some unmeaning syllables from morning to night, or during several hours every day; or, whilst lying otherwise motionless and seemingly insensible to outward impressions, to sing loudly and for a length of time a few particular notes, repeating them a thousand times. Pious ejaculations, hallelujahs, and snatches of hymns, we have thus heard vociferated to the excitement of a mixture of awe and amusement in those around the patient, who will sometimes seriously inquire whether the physician does not believe the patient to be bewitched.

Dr. Parry's notes (Posthumous Works) contain the case of a young lady of fourteen years of age, in whom menstruation had commenced a year before, and who, after being present at an exhibition of fireworks when but recovering from slight indisposition, complained of weariness and giddiness, and pain of head; on which ensued spasmodic motions of the hands and fingers, and convulsive actions of various parts, which continued for some hours. Two days afterward the attack returned, and, as she lay on her back, rather towards her right side, she threw the left arm and body backwards at measured intervals, exactly keeping time with two or three notes which she sang out with a strong and clear voice; and this scene was repeated every day from eleven to three at noon, and from eight to ten at night, leaving her much fatigued, after which she slept well. She was fond of music, and could both play and sing, but could assign no reason for the particular song so often repeated, but that "it was irresistible." These attacks were occasionally repeated for ten or twelve days more. When the treatment pursued began to take effect, the song began to disappear, but she was uncomfortable, or had an attack of headach, or cried and made pale urine at the usual hour of the attack. Dr. Parry succeeded in checking the convulsive motions by compressing the carotid artery: the patient was bled, leeches were applied, and purgatives and nitrate of potass and squill were administered.

The tendency of the phenomena of nervous disorders to return at stated intervals, although often observed, seems to have been forgotten in the instance of some of the most unusual forms, and cases of this kind have been erroneously classed, from the mere circumstance of the periodicity of the symptoms, with ague. (See the article Chorea in the 1st vol. p. 436; a case entitled *Leaping Ague.*)

Dr. Bright has given cases of hysteric hiccup, and of spasmodic exclamation, and of hysteric dysphagia. (Reports of Medical Cases, vol. ii. p. 457; cases ccxi, ccxii, ccxvi.) In the latter case the introduction of the probang induced an hysteric fit, which was immediately followed by hysteria in several females in the same ward; thus illustrating the effects of *imitation*, which we shall have to speak of among the causes of this affection.

The name of simulated pregnancy has been given to some cases of hysteria, in which the abdomen enlarges gradually, sickness occurs, and so many signs of an impregnated uterus are present, that time alone can solve the doubts they raise. The catamenia are suppressed, the breasts are tumid, and there is pain in the back. Mr. Tate says, of these cases, "in what this engorgement consists, I am utterly ignorant: that it is not a mere accumulation in the colon, I know; and that it is substantial, I am equally sure." (Treatise on Hysteria, p. 117.) It is, we apprehend, a mixed state of vascular fulness and tympanitic distension.

Dread of water, the disengagement from the body of electrical sparks, the occurrence of spontaneous emphysema, and the phenomena of somnambulism, have been observed in the hysterical; and cases of misplaced *senses*, which are entitled to little credit. We have dwelt sufficiently on the anomalous forms of the disorder in some degree to prepare the inexperienced practitioner for the singular appearances which hysteria often assumes. The older writers, whose observations were often made in religious houses for the reception of women devoted to celibacy, have recorded other examples, some of which we shall have occasion to refer to.

We shall not pretend to give any explanation of the surprising revelations or presentiments, or shadows of coming events, which have been said at times to be associated with the hysteric paroxysm. When the small portion of truth which such relations contain is separated from the fancy, the fable, and the fraud with which it has been invested, it may perhaps be rendered intelligible by the consideration that extreme excitement of the brain may lead in these states of disorder, as in troubled and vivid dreams, to combinations of images, and to probable suggestions concerning the course of events past or to come, which appear to a sober and healthy mind, unacquainted with such wild excitement, as too extraordinary not to be supernatural. Concerning animal magnetism, connected as it is with this part of our subject, we shall only express our hearty disbelief of most of the circumstances related by its supporters, and our conviction that the rest admit of explanation without having recourse to the principle the magnetizers so anxiously desire to establish.

Amidst such general disorder, the nervous system being so frequently, perhaps so invariably involved, the functions of the brain often become deeply affected. Increased susceptibility to impressions, celerity of movements, and capriciousness of motives, strongly characterize the hysterical female: her countenance indicates the mutability of her feelings; and when the constitution is intensely imbued with these characters, the most amiable sentiments are seen to be readily converted into jealous and fierce passions, and all sense of humanity to be lost in the gratification of cruel and remorseless impulses. Sydenham, whose industry and sagacity are equally discernible in all his writings, has left us a graphic picture of these effects, and his testimony will sufficiently assure the reader of their reality. "Upon the least occasion also," he says, "they indulge terror, anger, jealousy, distrust, and other hateful passions; and abhor joy, and hope, and cheerfulness, which, if they accidentally arise, as they seldom do, quickly fly away, and yet disturb the mind as much as the depressing passions do; so that they observe no mean in any thing, and are constant only to inconstancy. They love the same persons extravagantly at one time, and soon after hate them without a cause; this instant they propose doing one thing, and the next change their mind, and enter upon something contrary to it, but without finding it: so unsettled is their mind that they are never at rest." This description was perhaps intended by Sydenham to comprehend the hypochondriac character; and yet, although not to be taken as a general representation of the hysterical mind, we have seen it so exactly exemplified in the hysterical as to be greatly struck with the truth of this great physician's painting. Cases of this kind approach near to insanity; and, indeed, a mind subject to the violent agitations incidental to the hysteric constitution cannot be considered as perfectly sane. We would here beg to insert a caution to which the young practitioner cannot pay too much attention. We are inclined to think that cases of hysteria, in which the mind was principally affected, have occasionally been treated as cases of simple mania, and the patients placed in confinement with lunatics. Nothing more likely to have the most unfortunate effects upon the patient could possibly happen; and no care can be too great to avoid a mistake which would in all probability render such a case incurable and hopeless.

The disposition to dread the approach of disease on the occurrence of slight feelings of an unusual description has frequently been observed in those disposed to mania, and is a leading feature in cases of hypochondriasis: it is also seen in some instances of hysteria. The physician is hastily summoned as if to a severe disease, and finds no real cause existing for the patient's alarm. A morbid susceptibility of all parts of the nervous system disposes, in them, all parts to diseased, or at least to undue impressions; to false or diseased sensations, and to irregular or diseased actions. Any function consequently may, in the hysterical constitution, be readily disordered; as the respiration, the circulation, the digestion of food: any part may be affected with pain and the usual symptoms of confirmed disease; and, at length, the parts thus affected may really become the seat of inflammation or other disorder, and undergo a change of structure. For these ultimate results of hysteric disorder the physician should in all severe cases be prepared.

As the deeper shades of hysteria border upon or enter the confines of insanity, so the lighter comprehend several varieties of constitution characterized by increased susceptibility, and in which, some time or other, it is found that peculiar impressions evoke some of the hysteric phenomena. With many of these cases the guardians of education are more directly concerned than the medical practitioner; and the principles of their management may be gathered from the valuable observations contained in the article PHYSICAL EDUCATION, in the present work. It is quite certain that the unhappy temper and violent irritability of hysterical females, combined with their constitutional tendency to the hysteric paroxysm, is in some instances sufficient to bring on, almost at the will of the patient, attacks which occasion much concern to their relatives or friends; we have seen undoubted instances in which a temporary loss of muscular power, a singular diminution of the action of the heart, and an inability to speak, but without loss of consciousness, originated in the desire of a self-willed individual to distress the spectators, or to overcome opposition to some wayward desire; as if the wish to feign an attack brought on a real paroxysm. Frank mentions similar cases, and others against which it is very necessary that a young medical man should be on his guard. (Praxeos Medicæ Universæ Præcepta, cap. xiv. § lxxii. 22.)

It occasionally happens, however, that individuals whose education has long been completed, and whose temper and intentions are blameless, are driven by the intolerable sufferings of a highly susceptible nervous temperament to consult a physician; who will be more likely to be of service to them in proportion as he regulates the treatment of them according to the principles of the prevention of hysteric paroxysms. Rank, fortune, and reputation, are insufficient to counterbalance the evils attendant on such a temperament; and, unfortunately, those who are most subject to its distresses seldom possess the firmness and perseverance indispensable to a perfect cure.

Modifications of Disease by Hysteria.—It may be supposed that a disease capable of simulating so many others may modify some rather remarkably. The most important of its modifications are seen in the course of fever. Rivière, Baillou, and even Morgagni, entertained the idea of a distinct hysteric fever as a species; but M. Louyer Villermay justly considers such cases as having been nothing more than examples of anomalous symptoms belonging to fever. We have seen nothing in practice to make the opinion of the former authorities credible: it seems to have been purely founded on theory. But the incipient symptoms of fever, its progress, and the circumstances of convalescence, may be much modified by the hysteric constitution. Irregularity in the respective frequency of the pulse and the respiration; an hysteric fit, of the comatose description, ushering in the febrile stage; a disposition to delirium in a state bordering on sleep, yet in which the patient is conscious of what is passing around her; a very singular exaltation of the *tone* of the voice, without increased loudness; a state approaching to catalepsy, but with consciousness remaining; sudden and unexpected, but not always complete recovery; and transient attacks of mania; we have on several occasions observed: and in almost every instance in persons living an easy and indulgent life, and, with the exception of one or two cases in upper servants, seldom among the poor.

In the course of a severe attack of fever in a young lady at school, great alarm was one evening occasioned by the supervention of what was supposed to be *croup*. There was laborious breathing, a loud croupal sound, and great distress apparently existing in the throat, almost amounting to suffocation; and the patient was unable to speak. Similar attacks recurred every night for three or four nights, lasting for an hour or two. These gave place to paroxysms of severe spasm in the stomach, occurring with equal regularity; and these disappeared on the supervention of what might be termed *paroxysms* of sleep, which came on with a febrile exacerbation every afternoon: in the midst of cheerful conversation, intended to make the patient forget her sleep, she would drop instantaneously into a state of sleep the most profound, lasting however, generally, not more than a quarter of an hour, sometimes continuing about an hour. On awaking from this sleep the spasm of the stomach sometimes recurred, and there was occasionally a disposition to the croupal phenomena. This was a tedious and severe case, and excited great alarm in the patient's friends, although there was never any great appearance of danger in the estimation of a medical observer. On the importance of remembering that these and other odd accidents may occur in fever it is quite unnecessary to dwell. Few things are more gratifying to the physician than to be able, relying on his knowledge, to be calm and assured when all around him are in a state of agitation and dismay.

The patient who was the subject of the above case had been some months previously affected with rubeola: the eruption came out, and seemed to be disappearing at the usual period, when it suddenly broke out anew, and to such an excessive degree as to make it impossible to recognise the features of her face: whether or not this peculiarity was also connected with the hysterical constitution we cannot take upon ourselves to determine.

In another case of an hysteric young lady we have happened to witness two attacks of continued fever, with an interval of four years between them. On each occasion very severe hysterical symptoms have come on, recurring every day, or every other day, or observing longer periods, principally in the form of short spasmodic agitations about the chest and neck, followed by a disposition to crying, with more rapid agitation of the chest, apparently connected with irregular contractions of the diaphragm: a feeling of suffocation often ensued, sometimes with a temporary suspension of respiration, deep redness or blueness of the face, often only in spots or patches. The addition of such symptoms to the usual disorders of the febrile state constitutes a state of extreme and complicated disturbance and suffering, in which it is difficult to distinguish the effects of the fever from the hysteric accompaniments. Pain in the head, pains in the limbs and back, difficulty in moving, costiveness, dysuria, and many other symptoms, exist in such cases at the same time; and there is usually much tenderness of the spine, sometimes with, sometimes without uterine irregularity.

It would be impossible to enumerate the modifications which may take place in other diseases: any unusual assemblage of symptoms, or remarkable inconsistency in their respective severity or order, may awaken inquiry, and will generally be found to depend upon some degree of the hysterical character in the patient. The development of hysterical symptoms in the course of other maladies is occasionally dependent on weakness, either produced by the continuance of the disease or by certain accidents in its progress, or by particular kinds of treatment. Thus, in the debility of the stage of convalescence from fever, and after hemorrhage, and after parturition, and after the employment of very free bleeding, the occurrence of unmeaning laughter or tears, and other parts of the hysteric attack, are not at all uncommon, and always require some attention to their cause.

Whether hysteria has supervened upon some other disease, mixing with and modifying it, or has been in any other way produced, it has a tendency, when severe, long-continued, or frequently recurring, to produce further mischief, and new complications. Inflammatory actions, for instance, take place at or near the extremities or origin of previously irritated nerves; or, as some authors have expressed it, the disease of the system of innervation becomes combined with disease of the vascular system; and morbid changes take place in the brain, spinal marrow, nerves, or some of the organs supplied by them. In the course of a long hysterical disorder, and yet more readily in the course of a fever in an hysterical patient, the tenderness of the spine may become excessive; and disordered sensations and impaired powers of motion will indicate that something more exists than mere irritation. These symptoms may disappear as the patient recovers strength; but they sometimes attain a degree of intensity requiring especial attention, and even inducing an apprehension of danger. The spinal tenderness in these cases is very different from that excessive sensibility to the slightest touch which some hysterical patients evince during the hysteric attacks, and which is of a very evanescent character, often alternating with, or perhaps accompanied by, an equally morbid sensibility of the limbs, or of the articulations.

Hysteria is one of the disorders of which the consequences are much less serious, as far as the life of the patient is concerned, than its more violent phenomena would lead an inexperienced observer to fear. It can hardly ever, perhaps, be considered as in itself fatal. The secondary diseases to which we have already said it may lead may be fatal. Congestion or inflammation in portions of the brain may occasion death; or the patient may die apoplectic. M. Louyer Villermay has quoted a case of a young woman of fifteen, in whom a most violent hysterical attack ensued on the sudden suppression of the catamenia in consequence of terror. The paroxysm continued more than two days; *nothing was done for the patient's relief*, and she *died* on the third day, being only fifteen years of age. The patient had complained of a feeling of suffocation, as if a tight collar was fastened round her neck; the hypogastric region was tumid; she could not swallow; she was convulsed; the action of the heart was tumultuous; in short she had had every symptom of violent hysteria. On dissection, the stomach was found contracted, and strongly incurvated, (fortement revenu sur lui-même); the left cavities of the heart were empty, as were also the pulmonary veins and the arteries; whilst the right cavities, the pulmonary artery, and the veins, were gorged with black blood, chiefly coagulated. The cerebral veins and the sinuses of the dura mater contained much blood; but there was no appreciable alteration of the brain or spinal marrow, or their coverings, or in the nerves. The ovaries were very large and very firm, and enveloped in a partially transparent tunic, (une sorte de tunique albuginée, mais transparente dans plusieurs points.) In the interior of the ovaries there was a large collection of round vesicles, filled with an abundant mucous fluid, which required for its escape the separate puncture of each vesicle. (Traité des Maladies Nerveuses, p. 70.)

The same author is one of the very few writers on hysteria who have especially devoted a section to the appearances found in fatal cases. He adduces the testimony of Riolan, Blancardus, Binninger, Vesalius, Diemerbroeck, and Morgagni, as to morbid appearances in the ovaria more or less resembling those mentioned in the above mismanaged and most unfortunate case; without, however, concluding that such alterations, or any changes in the state of the uterus, are constant.

We spoke, some pages back, of the supervention of jaundice on hysteria, but this, like the occurrence of phthisis, can only be looked upon as an accidental complication. It may sometimes, however, happen that the patient, worn out by the long continuance of the malady and repeated paroxysms and frequent agitations, may become peculiarly liable to the supervention of the last mentioned disease; or may become affected with a slow fever, the body gradually wasting, and the strength decaying, and a premature death at length ensuing.

But among the peculiarities of the hysteric constitution, are to be reckoned some unexpected recoveries from states which seem to furnish an utterly hopeless prognosis. Of such singular cases and their termination we generally have an outline in the expression which all must on some occasion or other have heard employed, that such a patient fell into an odd state, and remained so for a year or longer; that nothing could be made of her case, and that at last she got better, nobody very well knew how or why. These curious reprieves are sometimes from what has appeared to be atrophy, or pthisis, or paralysis; but they have, we believe, occurred after a strong image had been presented of other incurable diseases and of impending death. M. Georget very properly guards the practitioner, therefore, against forming and pronouncing too hasty a prognosis in all cases of hysteria; observing that not only do such occasional recoveries sometimes unexpectedly take place, but that the course of diseases of a fatal character is often much more prolonged in the hysterical than in those of a different constitution. (Vol. ii. p. 288.)

Hysteria in Males.—We have met with a few instances which we consider to have been decided examples of hysteria occurring in males. The subject of one was a gentleman who had devoted himself with too great intensity to his studies, being designed for holy orders. After leading a life of great retirement at Oxford, and, in opposition to his temperament, of strict chastity, his mind became irritable, and he could not obtain refreshing sleep. On several occasions he was suddenly seized with violent sobbing, gasping, and anhelation, attended with a fear of immediate death by suffocation. During these attacks his face was flushed, the carotids pulsated strongly, and the heart was much disturbed; but he retained his consciousness. We were also acquainted, some years ago, with two gentlemen who were singularly intemperate in drinking, and in both of whom excess sometimes induced fits of sobbing and crying, with palpitation, a weak pulse, a loss of muscular power, a great dyspnœa, painful constriction of the chest, and fear of impending death. In cases of melancholia we have found the patients complain of violent agitation of the stomach and bowels, with a disposition to shed tears. We have known the silence of a sick-house unexpectedly disturbed by the uncontrollable and loud laughter of a patient dangerously ill of fever. Very decided hysterical symptoms came on during convalescence from fever in a boy who was a patient of the University dispensary: his mother was much troubled with hysteric fits; the boy's affection was evidently caused by debility, and disappeared as he regained strength. Sydenham relates the following case, in which the cause and the result were the same. It deserves to be quoted, both as an illustration of the practice of that great physician, and on account of the important relation of such cases to the theory of the causes of hysteric disorders in general.

"I was called," says he, "not long since to an ingenious gentleman, who had recovered of a fever but a few days before. He employed another physician, who had blooded and purged him thrice, and forbid him the use of flesh. When I came, and found him up, and heard him talk sensibly on some subjects, I asked why I was sent for; to which one of his friends replied, if I would have a little patience I should be satisfied. Accordingly, sitting down and entering into discussion with the patient, I immediately perceived that his under-lip was thrust outward, and in frequent motion (as it happens to fretful children, who pout before they cry), which was succeeded by the most violent fit of crying I had ever seen, attended with deep and almost convulsive sighs; but it soon went off. I conceived that this disorder proceeded from an irregular motion of the spirits, occasioned in part by the long continuance of the disease, and partly by the evacuations that were required in order to the cure; partly also by emptiness and the abstinence from flesh, which the physician had ordered to be continued for some days after his recovery, to prevent a relapse. I maintained that he was in no danger of a fever, and that his disorder proceeded wholly from emptiness; and therefore ordered him a roast chicken for dinner, and advised him to drink wine moderately at his meals; which being complied with, and he continuing to eat flesh sparingly, his disorder left him."[*]

This subject is of so much importance, particularly as regards the alleged dependence of all cases of hysteria on some disorder of the uterus, an opinion which cannot be admitted without materially influencing our practice, that we shall quote one or two more examples from authorities which cannot be called into question.

In Dr. Whytt's work on Nervous Disorders, which has already been more than once referred to, and which deserves, even at this day, an attentive and entire perusal, the following case is related, the connection of which with hysteria of the periodical character appears unquestionable.

"A boy of ten years of age, of a very sensible nervous system, who, in December 1747, had been seized with a palpitation of his heart, fell from his horse about the beginning of January. From this time the palpitation left him; but in a few days after he was attacked with a violent headach, returning sometimes once a day, at other times only every third or fourth day. During the fit his pulse became smaller and quicker, and often intermitted; his feet were cold, but, by the violence of the pain, a plentiful sweat broke out and relieved him. As these headachs continued to increase, the patient lost his stomach and flesh, and looked pale. By the use, chiefly, of an electuary of the bark and valerian, in less than three weeks the pain of the head abated greatly; but his appetite grew worse, and he often complained of a nausea. These symptoms, however, were all removed in four or five days, by some warm stomachic and cordial medicines, but were succeeded by an intolerable pain across the middle of his belly, which, in the space of eight days, returned five or six times, and not only affected his pulse, as the headach had done, but sometimes occasioned a difficulty and pain in making water. This pain no sooner left his belly than the headach returned with greater violence than ever, so that the boy used to faint in some of the worst paroxysms. It had no certain periods, coming sometimes twice a day, sometimes only once in two days, and was attended with a sense of suffocation from wind, and a lump in his throat. He was easiest in the night, when he slept or lay quiet, but any considerable motion of his body always raised his headach. Before the fits he was observed to be uncommon lively, and disposed to laugh. On the 21st of February, at two in the afternoon, he was seized with fits of involuntary laughter, between which he complained of a strange smell, and of pins pricking his nose: he talked incoherently, stared in an odd manner, and his complexion changed to a livid colour; immediately after he was seized with convulsions, and then fell into a fainting fit, which lasted near half an hour."

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[*] Op. cit. p. 381. Cases of hysteria in men are also mentioned by Louyer Villermay and by Georget: the latter quotes the words of Piso, (or Lepois, an author of the 17th century, whose name is latinized according to the custom of the time.)—Hysterica symptomata omnia fere vis cum mulieribus communia sunt. *Caroli Pisonis Select. Obs. et Consil.*, &c. We have no opportunity of referring to the original.

The remainder of the case may be abridged. Purulent matter was subsequently discharged from the nostrils and the right ear, with some alteration in the situation of the pain, which shifted to the back of the head, and then to the left side of the abdomen, "between the short ribs and os ilium, confined to a space little larger than the breadth of a shilling. This pain was often so severe as to make him ready to faint: sometimes it shifted, and then he was seized with fatiguing fits of involuntary laughter."

This case appears to have resembled some of those mutable examples of the disease which are more commonly met with in females, and in which the relief given to one affection is but the signal for the raising up of another, constituting cases comprehended in Dr. Marshall Hall's excellent description of "Disorder of the General Health."

The fact of hysterical disorders appearing in male subjects is supported also by the highly respectable testimony of Dr. Ferriar. (Medical Histories and Reflections, vol. i. p. 128.) "Men," he says, "are frequently attacked by complaints which approach to the hysterical type. In the following instance a young man was affected with regular hysteric fits, in consequence of continued vexation and anxiety. In spring, 1789, I was desired to visit a patient about seventeen years of age, on account of fits with which he had been seized a few days before. I was told that they began with great dejection of spirits, sighing, and uneasiness about the præcordi. He then became apparently insensible, but groaned much, and did not recover for a considerable time. He relapsed frequently, from slight causes, and often had three or four fits in a day. He said that he felt the globus hystericus at the approach of each paroxysm, and he said that he retained his senses, in some degree, to the termination of each. His pulse was weak and hurried; his tongue somewhat foul; and his countenance timid. His evacuations were natural. I do not recollect the particular nature of his employment, but it was of a sedentary kind. After clearing his stomach by an emetic, I directed some pills to be made up composed of opium and assafœtida, and to be given in such a manner that he took half a grain of the former and four grains of the latter every hour previous to the approach of the coming paroxysm. On the first day of taking the pills the fit came on, but in a slighter degree. The next day he was ordered to begin at a greater distance from the usual time of the fit. He took by this means three grains of opium, and more than a scruple of assafœtida. The paroxysm was effectually prevented by this dose, without producing the smallest uneasiness to the patient. Two of the pills were given at bed-time for a few nights afterwards, and the cure was finished by administering tonics."

In the above case the evidence of the *juvantia*, taken together with that of the symptoms, seems to leave no doubt of its being an example of hysteria; and we shall not dwell longer on this point, except to refer to a remarkable instance of temporary loss of voice from hysteria, occurring in a recruit in the East-India Company's service, and related by Mr. Watson, the surgeon of the ship on board of which the patient was a passenger. (Edin. Med. and Surg. Journal, vol. xi. p. 303.) The subject of this case was a strong healthy man, who complained first of giddiness and headach, was then convulsed, and had some of the symptoms of epilepsy, as distortion of the muscles of the face, and discharge of frothy matter from the mouth. After an interval of some hours these symptoms returned, with alternate laughing and crying, spasms about the throat, and inability to speak, although he was perfectly sensible. After being twice bled, and having a blister applied to his head, and taking some active purgative medicine, he recovered his speech in about forty-eight hours. The account he then gave of himself was that he was prevented from speaking by a tightness in his throat, which felt as if something was in it. Mr. Watson observes that but for the supervention of those symptoms the case would have been considered as epilepsy. It is worthy of remark that another case occurred on board of the same ship about a fortnight afterward, of which the subject was an artillery-man, who, however, recovered his speech on the following morning. Mr. Watson, in conclusion, quotes Dr. Trotter (Medicina Nautica, vol. ii.) as saying, "We found not a few of the cases sent to the hospital-ships subject to very frequent fits of hysteria; and where this singular affection occurred, with as much violence of convulsion as we have ever marked it in female habits, attended with globus, dysphagia, immoderate risibility, weeping, and delirium."

These cases and authorities are, we think, sufficient to set the question at rest. The cases of hysteria in men must, however, still be considered as rare; although we have met with few observant practitioners who have not answered our inquiries on this point by stating that they had seen one or two examples very much resembling it.

Diagnosis.—The importance of not pronouncing serious diseases to exist which are only simulated is almost equal to that of not overlooking serious disease when it is really established: in the latter case the patient's life may be sacrificed to neglect; in the former it may be destroyed or endangered by unnecessary activity. For these reasons we have already insisted on the propriety of every opportunity being taken to enlarge the practitioner's knowledge of the varieties of hysteria; and it is equally necessary that he should keep in mind the tendency of all the violent forms of this disorder to pass to severer and more permanent lesions of function, and even to lesions of structure. Fortunately, the diagnosis of the most important cases is commonly the easiest; as it is more easy to recognise and verify the symptoms of severe diseases, the existence of which may be apprehended. Cases, however, will now and then present themselves requiring the greatest degree of circumspection, and the circumstances in which the patient is placed are often of a nature to produce agitation and haste, of which the effects are most pernicious. It is only by a careful study of the symptoms of diseases of the brain, lungs, heart, intestines, liver, kidney, and other important organs, and by a scrupulous comparison of *all* their symptoms with the case before him, that the practitioner can escape deception; for many symptoms may be present without real disease, and sometimes serious disease may be present and yet only partially represented by the ordinary symptoms. The slightest admixture of hysterical phenomena forms a sufficient ground of suspicion, and any great departure from the ordinary course and effects of maladies should alone awaken great vigilance. Great mutability of symptoms, or intervals of ease alternating with symptoms of much violence, will generally declare the nature of the case at once. There is, in truth, nothing so difficult to be written, or to be learned by reading, as diagnosis, in this as in all other instances; but habits of caution, of tranquil observation, and of careful consideration, may be learned by every practitioner of ordinary capacity; and, thus disciplined, he will seldom be deceived, even by hysteria.

To distinguish hysteria from epilepsy, a disease generally so much more formidable, is of such great importance that almost all who have treated of these diseases have attempted to lay down certain marks of difference between them. Yet M. Louyer Villermay informs us that M. Pinel, on instituting an examination of the patients detained in the Salpêtrière as epileptic, found a great number of women, several of them young women, who were only hysterical, and yet who were separated from their families and from society. (Traité des maladies Nerveuses, vol. i. p. 117.) To pronounce a young female patient epileptic is often in its consequences only second to pronouncing her insane: the disease is considered to be incurable, to have a tendency to destroy the understanding, and to be transmissible to offspring; none of which terrible evils are associated with the name of hysteria.

The attack of hysteria is commonly less sudden and less violent than an attack of epilepsy. Epilepsy is often ushered in by a loud cry; the patient falls violently to the ground; the muscles of the face are severely convulsed; the eyes are distorted; the tongue is protruded and bitten, and frothy saliva forced out of the mouth. In hysteria there is seldom any incipient cry, although the patient may cry or laugh during the paroxysm; the patient, except in the comatose variety, does not fall suddenly, but, feeling the approach of the fit, is usually attacked after sitting or lying down: the muscles of the face, and the eyes, are usually tranquil, and the face is generally flushed, whereas in epilepsy it has often a ghastly paleness. The hysteric patient does not protrude or bite the tongue, nor is there a discharge of frothy saliva. The epileptic patient does not laugh or shed tears, but is in a state of fixed and intense agony; neither is globus a sensation known to him. After the fit the epileptic patient generally falls into a heavy sleep or sopor. During the paroxysm of hysteria the pupils of the eyes are commonly sensible to light, which is not the case in epilepsy. After the paroxysm the hysteric patient often remembers all that has passed, which the epileptic does not. It may be added that epilepsy is most common in men, in whom hysteria is rare; and that the character, habit of body, and history of the cases, will frequently afford instructive circumstances of difference.

It was Sydenham's custom, he tells us, always to inquire whether any particular disorder about which he was consulted in women did not chiefly attack them "after fretting, or any disturbance of mind;" and, in an attempt to make a difficult distinction, such an inquiry, and others of a similar tendency, will sometimes not be found superfluous.

"The patients and the nurses at the Salpêtrière," says M. Georget, "attach the principal importance to the three following characters of epilepsy: the want of precursory symptoms; the complete loss of consciousness; and the distortion of the mouth and state of the eyes. They say of a case of hysteria passing into epilepsy, that the patient begins 'to laugh on one side' and 'to turn her eye,'—*à rire de côté*, et *à tourner l'œil*." The cases here pointed to, cases of mixed epilepsy and hysteria, are certainly now and then met with; and their character is of course only to be determined by the assemblage of symptoms in each.

The remarkable impression left on the countenance by successive attacks of epilepsy is familiar to all medical observers: there are few instances in which the face presents no trace of the storms which have passed over it and over the whole frame. The same protruding eye and dulness and passiveness of look are not seen in the hysterical; and when the hysteric character is at all imprinted in the physiognomy, it is rather to be read in a changeful expression, and unquietness and want of repose in the face, which it is not easy to describe.

Causes. — A mere inspection of the various forms of hysteria would, one would suppose, be of itself sufficient to show that all were not very likely to arise from one kind of cause; but that, if all the causes are admitted to act on the brain, and through the nervous centre on the parts affected in the paroxysm, still the seat of the primary irritation is various. But, perhaps from the disposition in the human mind to avoid a complication of difficulties, many authorities have ascribed all the varieties and examples of hysteria to some one irritation, as, for instance, to irritation of the uterus. A comparison with one another of the examples of this disorder which have fallen under our own observation leads us to reject all such exclusive views of their origin, and to believe that the causes of hysteria may consist of any circumstances capable of producing a particular excitement of the nervous system, or certain portions of it, which excitement leads to all the other phenomena. Of the primary irritation we should say that by far the most common seat is the uterus and the intestinal canal; but that sometimes the irritation is such as primarily to affect the whole nervous system, as plethora, anæmia, atmospheric changes, and mental impressions. Such being the exciting causes, of the predisposing cause we can only say that it is a peculiar and constitutional susceptibility to impressions, with an inherent disposition to institute certain actions affecting particular organs and functions, the object of which actions seems to be the relief of the nervous system, sometimes by the equalization of the circulation. We are not more able to explain the form of these actions, or the hysterical paroxysm which supervenes on the cerebral excitement springing from the primary irritation, than we are to explain the ordinary phenomena of laughing or crying, arising from a similar cerebral excitement originating in impressions primarily affecting the mind.

That certain states of the uterus, causing peculiar sympathies in different parts of the frame, are the causes of hysteria, is an opinion of great antiquity, and has been supported by nearly every observer from the time of Hippocrates, who has often been quoted as saying that a woman's best remedy in this disorder is to marry and bear children. Whoever considers the sympathies excited by the changes which the uterine system undergoes at puberty and during pregnancy, and at the cessation of the catamenia; the altered form and character of the young female; the capricious wishes and taste, or *longings* of the state of utero-gestation; and the morbid actions of what is called the "change of life;" will without difficulty admit that the hysterical phenomena, bodily and mental, may very probably be called forth by peculiar conditions of the same dominating system in the female economy. Extensive experience confirms such an opinion; and the occurrence of hysteria in early life, or after marriage, or at a later period, is so often observed in individuals in whom there are evident signs of the activity of the uterine system, as to connect the two circumstances together in the firmest manner. Precocious development and disappointed hopes on the one hand, and excessive indulgence, or marriages immature or physically disproportionate on the other, are causes of hysteria of which every practitioner finds illustrations within the circle of his own practice; as well as of the disappearance of hysteria after a long-desired marriage, or when means are taken to prevent hurtful excesses. In some females hysteria supervenes on puberty, continues to be more or less troublesome until the period of cessation, and then disappears. In others, as was remarked by Hippocrates, it disappears during pregnancy. And in the few cases in which death has seemed to supervene on simple hysteria, disease, as has already been mentioned, has been discovered in the uterine appendages. We cannot therefore be surprised to find that many ancient and modern writers have considered hysteria as being solely a manifestation of a disordered uterus; and that various theoretical notions have been engrafted, in the different periods of physic, upon this too exclusive opinion; some of which have been disproved by the progress of anatomy and physiology, such as the dependence of hysteria on the ascent of vapours from the womb, and of the symptom of globus on the ascent of the womb itself. To such notions we now only allude as curious remains of an age delighting in medical conjectures, and unpossessed of means of obtaining more accurate knowledge. But the facts on which such theories and practices conformable to them were built, yet remain; for nature and the laws of the human body are yet the same. In a susceptible female temperament, and in the unmarried state, the system of reproduction, every change in which involves many other changes, acts strongly on the system at large, and in certain circumstances disorders all the functions of the body and the mind; the digestion of food, the circulation of the blood, the judgment, the affections, and the temper; and in many of these cases all the mischief is removed by marriage, which, by awakening the natural functions and normal sympathies, allays the whole series of irritations or morbid actions. There can, therefore, be no reasonable doubt entertained that in a great many cases—perhaps we might say in the majority of cases—the cause of hysteria is some more or less discoverable irritation existing in some part of the uterine system, exercising its wide influence on the susceptibilities of a nervous system by nature too easily affected by all impressions. We may perhaps agree with M. Louyer Villermay to call this "a nervous disturbance, an exaltation of organic sensibility of this organ;" but we must add that his statement of the proofs of such a condition, drawn from the asserted state of the hypogastric region, of the vagina, &c. &c. (Dict. des Sciences Méd. art. *Hystérie*), however consonant with the older doctrines, has an air of inefficient practical observation which would almost lead us to doubt, with M. Georget, whether or not he had actually ever seen a case of hysteria. The very abuses to which such a theory has led and must lead, and the unjust suspicions to which it would often give origin, are sufficient to draw even a minute attention to its foundation.*

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* For an illustration of this the reader is referred to the case of a nun in Sauvages' Nosol. Method. tom. iii. We cannot venture to quote the treatment, although recorded in a learned language. The substance of the ancient uterine theory and some of the singular methods of cure which originated in it may be read in Sennertus

As far as the writer's experience has extended, and from observations made whilst recording very numerous cases, comprehending nearly all the forms of amenorrhœa, hysteria very rarely supervenes on the amenorrhœa of *young* women; and, compared with its frequency *after* the age of twenty, very seldom appears *before* that time. In cases, also, in which the hysteria has most plainly depended on the suppression of the catamenia, the comatose form of the paroxysm has appeared to be the most common. We have frequently found hysteria coexistent with chronic leucorrhœa and repeated attacks of menorrhagia, in circumstances clearly indicative of what might be termed an irritable uterus; in individuals liable to frequent miscarriages, and in whom the stomach and bowels suffered much sympathetic disturbance. In these cases there is, we believe, generally a disposition to change of uterine structure; insomuch that we should say that a patient who has obstinate hysterical symptoms, and now and then a paroxysm, in early life, or between twenty and thirty years of age, has, in a majority of instances, a predisposition to serious uterine disease, requiring great attention. As such patients advance in life, it will be found that the symptoms become more troublesome, and the sympathies of the whole constitution stronger; whilst in many of the cases there takes place a congestion in the vessels of the uterus, or a sub-inflammation, or indolent tumours are formed, or polypi are thrown out from the interior of the uterus, or the uterus descends lower than its natural position, or malignant disease makes its appearance. We should observe, although it seems to contradict the little that is recorded of the morbid anatomy of the disease, that in the most confirmed and striking examples of ovarian disease which we have met with, there have never been any hysterical symptoms, even of the slightest kind.

These observations, which are the simple result of some attention paid to this subject during several years, added to the fact that hysteria sometimes occurs before puberty, and sometimes after the cessation of the catamenia,* whilst they confirm the opinion of the frequent connection of hysteria with uterine disorder, lead us to regard it as having much less connection with the catamenial function than has been maintained, with a positiveness greater than we think extensive experience would warrant, by some of the most recent writers on hysteria. The question is of great practical importance; but we must now leave the consideration of it to the reader.

We are ourselves convinced, then, that the uterus is not the only organ of which the irritations may so affect the nervous system as to produce hysteria; and this not only from the above considerations, although supported by additional cases in which the uterine functions have continued to be perfectly performed,† but because there is in many instances of hysteria such evident disorder of other functions, and so manifestly, as it has appeared to us, leading to every form of nervous irritation of the hysteric kind up to the paroxysm itself. We might, indeed, adduce the occurrence of hysteria in *men* as at once decisive of the question, but we do not think it absolutely necessary to the argument; although, if such cases are admitted, they must inevitably be taken as putting an end to it.

Among the most frequent causes of hysteria next to uterine irritation, must be placed gastro-intestinal irritation; whether from excess, or from improper food, or from depraved or deficient secretions, or from diminished peristaltic action, and the delay in the intestines of the natural excretions. The extent to which the proper evacuation of the bowels is neglected in female patients is almost incredible, and is so often the sole cause of the ailment under consideration and of many others, that we cannot wonder at the general acceptation of the aloetic or purgative treatment of their disorders. The presence of worms has sometimes excited hysteria; (the hysteria *verminosa*. *Sauvages*, Nosol. Method. tom. iii.) Perhaps it may often be an unsuspected cause: we have seen the most violent and repeated attacks of epilepsy, which had recurred for many months, cease after the passing of one large round worm. All the causes of indigestion may become causes of hysteria to those whose constitution of nervous system is predisposed to be acted upon in the specific mode, whatever it be, in which it is affected when the hysteric phenomena are produced. In many cases of hysteria there seems to be a peculiar sensibility of the gastro-intestinal mucous membrane, giving rise to irritability of the stomach and bowels, and thus disordering the nervous system; and such a state may sometimes be the exciting cause of hysteria, sometimes by its influence only predispose the nervous system to the specific irritation of hysteria on the supervention of any of the other causes. The effect of improper diet, either as regards food or drink, in increasing the nervous susceptibility to all impressions, is probably produced by the intervention of this gastro-intestinal exaltation of sensibility, of which indeed, in such cases, there are many proofs. It seems to be in this manner that luxurious livers and excessive drinkers are always at length punished by an uneasy digestion, and by all the pains of what is commonly called *nervousness;* which last, increasing by degrees, sometimes converts a brave man into a coward, and invariably disqualifies men more and more for great and original undertakings, and even for sustaining the ordinary reverses and agitations incidental to social life. When it is considered that the nervous expansion over the intestinal tunics has been described as analogous to the expansion of nerve constituting the retina, we can readily believe that much disorder may be effected by irritations of this nervous expansion without necessarily ascribing them to circumscribed attacks of enteritis, as M. Broussais has done. In many cases, in which no positive signs of such inflammations exist, the irritations cease or are greatly

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tom. iii. lib. iv. pars ii. sect. 3, cap. 4. *De suffocatione uteri;* and a refutation of much of the theory may yet be referred to with advantage, in the writings of Willis, De Morb. Convuls. and Van Swieten. Willis notices the occasional occurrence of hysteria before puberty, of which we have seen one remarkable example.

[*] *Willis*, op. cit. See also Dr. Bright's Cases, vol. ii. case ccxx. This was a case of nymphomania after cessation, accompanying uterine disease. M. Georget would consider it a case of *cerebral* disorder.

[†] For a case of this kind, in which there was hysteria with temporary paralysis and no uterine irregularity, see Parry's *Posthumous Works*, vol. i. p. 370.

mitigated on the appearance of fæces indicative of depraved secretions; cases described by the older physicians as abounding in *phlegm*. The motions in such cases are dark or olive-coloured, sometimes passed with much pain, although not hard, and seldom procured without medicine. The excessive flatus which is the torment of certain hysterical patients is in all probability connected with some morbid condition of the intestinal nerves; may in fact be looked upon as an excess of a natural product in the intestines, the result of deranged actions. Partly from the stimulus of so much air, and partly from the morbid condition of the intestines, which produces it, the muscular fibres of the intestines are thrown into commotion, or at least excited to vehement action, creating a feeling of movement and a rumbling noise which becomes a source of annoyance to the patient. Upon this disordered state spasm frequently supervenes, and it would seem generally to commence in the lower part of the intestines, near the termination of the colon in the rectum, and to ascend, producing the feeling of globus already described.*

It happens, however, not uncommonly, that even when the state of the uterus is the real cause of the hysteric disorder, the suppression or insufficiency of its accustomed secretions is followed by such derangement of the digestive organs, that the hysteric phenomena appear wholly to depend upon the latter; a fact which did not escape the observation of Whytt, who remarks that "when the menses are obstructed, the stomach generally suffers first, and by means of its *consent* with almost every part of the body, gives rise to many of the complaints which follow. Thus the hysteric convulsions and other violent symptoms which are sometimes occasioned by a sudden stoppage of the menses, do not seem to proceed immediately from the uterus, but commonly from the stomach and bowels, whose nerves are first affected either by their sympathy with those of the womb, or by the blood which should have been discharged by this organ being partly turned upon the alimentary canal." (Opus cit. p. 177.) But, on the other hand, it is equally certain that attention to the order of the phenomena in hysteria will often detect the priority of the intestinal disorder, which the uterine irregularity seems, in such cases, to follow as a consequence. Such are the complications met with in practice; baffling to those who trust wholly to their books, and only to be prepared for by a careful clinical education; a kind of education not confined to the schools, but within the reach of every practitioner who has access to numerous examples of disease.

Either the uterine disorder or the intestinal disorder, which are thus seen to have the power of producing each other, may produce the nervous irritation, or the congestion, or whatever morbid condition it may be, of the nervous system, or of certain portions of it, which induces the hysteric paroxysm. Either of them, also, may thus act as a cause predisposing to the hysteric paroxysm, or as a cause exciting it without the supervention of any other known cause.

Another cause of hysteria, also, sometimes predisposing to, sometimes exciting the paroxysm; sometimes connected with uterine disorder, sometimes leading to it; is a plethoric condition of the body, or of the nervous system, or apparently of portions of that system. The appearance of the patient commonly indicates the presence of this cause in patients who are indolent and overfed; but as it is often combined with an oppressive feeling of debility, with a pale or bloated complexion, and a languid pulse, and as the plethora may exist with reference to the strength of the patient only, it sometimes escapes attention.

Both hysterical and epileptic attacks are occasionally attended with hemoptysis. We think, also, that it is too common to set down cases of periodical vomiting of dark-coloured or sanguineous fluid as dependent on uterine disorder, when, although the menstrual discharge may be rather less than natural, really dependent on plethora. Patients of the description here meant complain of pain of the stomach, distension, flatus, and coldness of some portion of the abdomen, followed by the vomiting. The pain and other symptoms alternate with severe pain at the upper part of the head, accompanied with several symptoms which may be called nervous, such as a sense of coldness in the eyes, nose, and face generally; and they are subject not only to great agitation of spirits on slight occasions, but to severer symptoms, such as temporary insensibility, seemingly connected with fulness of the cerebral vessels. They also often complain of pains and swellings of the hands and arms, and feet and legs; they are soon and much disordered by errors of diet; inclined to be fat; subject to profuse perspirations on making slight exertions; and their bowels are constipated, as well as the catamenia deficient. In such cases the plethoric condition finds no natural or no effectual relief; and bleeding and medicine must be the substitutes for the dietetic restraint and proper regimen which often cannot be enforced, as well as for the vomiting which has already established itself.

All convulsive affections seem to be capable of being produced both by plethora and the opposite state of debility, or deficiency of nourishment. This may arise from defective powers of digestion and assimilation, or be a consequence of previous disease of some continuance, as leucorrhœa and menorrhagia; or of a recent confinement, (*Whytt*, Opus cit. p. 186, who also refers to a case in the Phil. Trans. No. 174); or of protracted nursing; or arise from various other causes which it is unnecessary to enumerate, including any which may lead to a depravation of the blood as well as to deficiency of its actual or relative quantity. It may be worth while to mention that repeated bleedings and excessive purging may have the same effect. (*Sauvages*. Nosol. Method. "a repetitis phlebotomiis et catharticis.")

Some of the older writers laid considerable stress on the influence of a gouty constitution in predisposing to hysteria. Facts of this kind are not easily verified; and hysteria may occur in a gouty family without being really connected with a gouty constitution. There can be no difficulty, in an age when a new and more enlightened pathology of the fluids seems to be dawning, in admitting so much of the ancient humoral pathology as to allow that either a gouty or any other morbific matter in the blood may be the occasional exciting cause of those nervous irritations which characterize a susceptible temperament, just as, in other cases, the same morbific matter, by irritating the nerves of the extremities, appears to excite the common pains of gout and rheumatism. The nervous irritation in these latter examples is sufficiently well established; the existence of a morbific matter yet remains to be proved.

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* Other irritations of the intestines seem also to commence in the lower portion, and to proceed upwards. Diarrhœa commonly precedes vomiting in the cholera. Herniæ excites irritation *above* the protruded portion of bowel or omentum. The symptom of globus has been noticed in some instances of severe gastritis, and is in such cases supposed to depend on spasm of the cardia extending to the œsophagus. Broussais considers it as indicating inflammation of the whole stomach; but what bears somewhat on the present subject is that in these instances the capacity of the organ has been found greatly contracted, reduced to the capacity of the small intestine. See GASTRITIS.

Climate, seasons of the year, occupations, and sex, have generally been enumerated among the causes creative of a predisposition to what has been termed *mobility*, and what we have spoken of as increased susceptibility of the nervous system. The situation of a country, its soil, its climate, and even its government, determine the occupations of the mass of its inhabitants, and by giving greater or less excitement to their faculties, naturally cause more or less activity and enterprise. The susceptibility which predisposes to various nervous disorders is thus undoubtedly increased or lessened. All the disorders of the mind are said to be less common in Spain and in Turkey than in England. But, as regards hysterical disorders, it is seldom that we have any reason to refer their origin to causes of such general operation; except it be to climate and to seasons of the year. Joseph Frank says that his own observation has taught him that spasmodic affections of all kinds are more frequent in Italy than in any other countries.[*] Yet the women of Lapland have been described, although we cannot quote our authority for it, as being so susceptible to impressions as to faint on any sudden noise occurring near them. We have ourselves often remarked the increased discomfort of hysterical subjects in warm and showery weather; and especially, without such decided reference to increased temperature, their aversion to the supposed disturbing influence of a cloudy sky: they sometimes say that they "can *feel* the clouds."

Dr. Mead enumerates hysterical disorders among those which are influenced by the *moon;* returning when there is a new or full moon: and he refers to a case related by Dr. Pitcairne, and to two recorded by Piso,[†] one of which was that of "a lady of quality, whose left cheek and part of the neck were wont to swell very sensibly about the new moon."[‡] We have already spoken of the modern disregard of all notions of this kind, (see the article DISEASE, vol. i. p. 688,) and shall say nothing more on this occasion than that, true or false, fanciful or real, we have hardly ever known a patient affected with a nervous disorder whose attendants did not stoutly assert these much derided influences.

The influence of sex and of education is more generally admitted, and indeed much more palpably and generally evinced. Medical philosophers declaim, and will long declaim in vain, against a system of education which, apparently solely directed to securing an advantageous establishment to young females, leaves them at once artificial and ignorant; full of the terms of many kinds of knowledge, but wearied or disgusted with all; trained to subdue the feelings only so far as to form alliances from selfish motives, but unprepared to be the companions of intellectual men, or to bear the neglect which their insipidity, or motives as selfish as their own, too often entail upon them. The predominance of the uterine system, although much less marked in the generality of cases in this country than in those in which the observations of some of the continental writers have been made, is yet sometimes sufficiently declared; and the disappointments of females who begin to feel that they are no longer young, and yet who have not become wives, have in many cases effects sufficiently observable. English practitioners pay, perhaps, too little attention to these circumstances; and, exercising their profession in a country where the passions and emotions have but a limited external manifestation, and where the female character is less intensely expressed, sometimes seem to forget their silent operation on the frame, and are inclined to charge the medical writers of other countries with being somewhat fanciful and extravagant.

"The social position of women," observes M. Georget, (Op. cit. vol. p. 193,) "renders the sex, already subjected to peculiar ills from their organization, the victims of the most acute and painful moral affections. Their moral existence is entirely opposed to their faculties; they possess a will, and are constantly oppressed by the yoke of prejudices and social arrangements in their infancy and early life; of a husband in their youth; and of indifference in old age. Sensible and loving, they must only love when the master orders them: they are for ever constrained to concentrate within themselves the most powerful passions and the gentlest inclinations; to dissemble their desires; to feign a calmness and indifference when an inward fire devours them, and their whole organization is in tumult; and to sacrifice to a sense of duty, or rather for the happiness of others, the happiness and tranquillity of a whole life." "The education of young women, of which the tendency ought to be to repress the affective faculties, already too prominent, has, as now conducted, opposite effects. A mother would be in despair if her daughter did not give early indications of *acute sensibility*, and nothing is neglected that may endow her with this fatal present: inaction of the muscular system; the cultivation of music; frequent parties, balls, and public entertainments; the understanding unemployed; or books perused which do but excite certain feelings, and nourish illusions contrary to the actual state of society;—such are often the different influences to which girls are subjected at an age when the powers of the mind should have quite a contrary direction. The end answers to the means; one order of faculties alone is exercised; and this will become predominant over the reasoning faculties, and the cause of a host of vaporous, hysterical, hypochondriacal and maniacal disorders."

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[*] Quamvis spasmi nec in regionibus septentrionalibus desiderentur, eos tamen longe frequentius in Italia obvenire, meæ docent observationes. Prax. Med. Univ. Præc.

[†] De morbis a serosa colluvie. Piso attributed hysteria to a serous colluvies at the origin of the nerves.

[‡] *Mead*, On the influence of the Sun and Moon upon Human Bodies, and the Diseases thereby produced.

Making due allowance for the different character and habits of the two countries, we cannot doubt the justness of these censures. And even in England, where an acute sensibility is less desired for young women than accurate powers of *calculation*, the improper expectations, the vain rivalries, the restless and frivolous pleasures of fashionable life, are but too well calculated to produce all varieties of nervous disorders in young persons whom an affected refinement has debarred from active and natural exercises, and whose minds have never been accustomed to the exercise of self-control.* In the middle classes different causes are in operation; and women of that class are at present subject to mortifications arising from the inferiority of their husbands in attainments and in cultivated sensibility to themselves. The gentle passions and the romantic feelings, utterly banished from the cold atmosphere of the higher ranks, have yet some sway in a class below them, and there produce occasionally their peculiar effects on the female frame.

But there are causes of disquietude which pervade every rank: for if the utmost attention to fashion could wholly still the voice of the natural feelings, it cannot suspend the inevitable flight of years and advance of old age; a phantom uninviting in its aspect to all, but to the fair, the frivolous, and the vain, a spectre of the utmost horror. On this subject M. Georget has expressed himself in language too applicable to every nation. "Man, as he advances in age, increases in power, in fortune, in dignities, in consideration. It is quite otherwise with woman: the progressive steps of life, when youth has once passed away, are for her an actual descent in the social ranks, and the sources of painful moral affections. There are few who can see without regret their attractions fading, and the flight of smiles and love, and the loss of the empire of beauty: these losses are felt the more keenly, because it is from others that the first knowledge of them is derived; for self-love makes many struggles, and the unwelcome persuasion is only established after many mortifications." "If devotion does not effect a salutary diversion in the ideas, or if a truly philosophical resolution does not early impart to woman the courage and firmness necessary for clearing this terrible abyss, the critical age becomes a stormy period, abounding in vapours, mental disorders, hysterical and hypochondriacal affections, often ascribed, without consideration of their origin, solely to that period of life, or to the cessation of the catamenia."

The causes acting through the mind which have now been mentioned, are occasionally exciting causes, but much more frequently only predisposing. Mental impressions of a more sudden and transient character may act as causes immediately exciting a paroxysm; such as anger, grief, terror, or great surprise. It is unnecessary to accumulate illustrations of the powerful effect of these impressions; the slight operation of them in their lower degrees is familiar to the commonest observation. But from this slight operation, involving mere disorder in the vascular and nervous systems, indicated by blushing or paleness, by palpitation, by increased excretions, by hesitating speech, may be observed gradations to the more severe results of slowly formed disease of structure, as in the heart; or of changes more rapidly produced, though less important, as in the colour of the hair. More commonly, however, the severer results are produced by causes long operating on the mind: whilst the more sudden impressions, when their violence is greater than ordinary, produce a simple loss of power in the nervous and muscular systems; the state of syncope, from which there is a gradual recovery by moderate reaction: but this loss of power may be greatly protracted, no reaction may take place, and death may ensue; or overwhelming reaction may be produced and fatal apoplexy. Generally, however, the severer shocks lead to a reaction, which is violent without being fatal; and after the feeling of faintness or depression, or sometimes almost without time being afforded for that feeling, the muscles are thrown into disordered and energetic motions, and all the vascular and nervous actions become irregular or tumultuous, and assume the form of hysteria or of epilepsy. Even the mimic representation of the more agitating passions will sometimes produce these effects; and hysteria has converted the cries and screams of the actress into reality, whilst the female part of the spectators have been similarly affected. Dr. Gregory used to relate that when Mrs. Siddons first appeared in Edinburgh, these effects upon the audience were so common, that it became quite the fashion for the young men of the place to attend the theatre to carry off those affected; a service which was termed "carrying off the dead."

We cannot help again, in this place, endeavouring to impress upon the reader that sometimes the reaction after these sudden impressions takes the form of acute delirium. There is no inflammation of the brain or its membranes, no discoverable change to be detected after death, when death occurs; and the best treatment is *not* the active treatment sometimes resorted to, but the treatment proper for hysteria. Above all things, the practitioner must avoid sending such cases to a madhouse. Whenever such attacks are found to have suddenly supervened on an acute moral impression; after violent disappointments of the affections; vehement invasions of jealousy; or even after marriage, when there is reason to suspect the existence of peculiar physical circumstances which can here only be alluded to, the practitioner cannot be too little precipitate in his measures. One or two remarkable cases of the latter kind have come to our knowledge, where the result was fatal; and we think their real nature has not been sufficiently reflected upon.

Another mental influence productive of hysteria requires to be mentioned; because it suggests certain precautions in the management of such cases; namely, the influence of imitation. One hysterical patient in the ward of an hospital will sometimes produce many more. Of this an instance has already been mentioned on the authority of Dr. Bright; and these effects have been so often noticed, that, generally speaking, no place can be less suitable to patients affected with hysteria than an hospital. Even in private practice such communications of disease occasionally take place. Dr. Gregory used to mention an amusing instance of a lady's maid thus involuntarily imitating her mistress; and M. Louyer Villermay mentions similar accidents in the article *Hystérie*, in the *Dictionnaire des Sciences Médicales*. Dr. Darwin speaks of the inmates of a nunnery who were all afflicted, one after the other, and at length altogether, with a desire to imitate the inharmonious nocturnal sounds of cats. Dr. Whytt alludes to a disease common in the island of Zetland, and almost exclusively affecting young unmarried women; sometimes, however, appearing in the male sex; in which there was first violent palpitation, and then the patients fell to the ground; their arms and legs being either convulsed or rigidly extended, and their respiration difficult. The great inconvenience of this affection was, that when any one was attacked with it, at church, in the market, or in a public place, straightway all who had ever been subject to it were attacked again; whilst others, in the great disturbance thus occasioned, became for the first time similarly affected. All these examples merely illustrate the proneness to imitation which is observable in all persons in early life, and which continues longest to adhere to the character of nervous and very susceptible persons, and consequently to many women. This is particularly seen in schools, which have sometimes furnished remarkable cases of squinting, stammering, and awkward motions, solely occasioned by imitation.

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* The reader may be advantageously referred to Dr. Parry's admirable remarks on the Effects of Habits in creating Predisposition to Disease. Elem. of Pathol. and Therap. vol. ii. See also the article PHYSICAL EDUCATION.

The celebrated Boerhaave, his nephew Kaau Boerhaave informs us, was consulted concerning the occurrence of a more serious affection which was introduced into the house of charity at Haerlem. A girl having become subject to paroxysms of a convulsive disorder, in consequence of fright, one of the bystanders on the occasion of one of her attacks had become affected in the same way, and then a third, and afterwards a fourth; and subsequently almost all the boys and girls in the institution. Like the people of Zetland, too, as soon as one fell into a fit, all the rest followed. The malady was considered to be epileptic, and all the usual means of relief were tried without the least effect. Boerhaave, therefore, determined on trying what could be done by a powerful mental impression; and, with the concurrence of the magistrates, caused several portable furnaces to be introduced into the house, containing burning coals; and in these furnaces were placed irons bent to a peculiar form, for the purpose of being made red-hot. Assuming great gravity and dignity of manner, he declared, in the hearing of all the boys and girls, that other means being useless, it was requisite that whoever became attacked with the fits should immediately be burnt in the arm with one of the bent irons, and to the very bone. It is added that the children, terrified by the idea of this remedy, were enabled to resist all tendency to a recurrence of the troublesome disorder which had affected so many of them.

Dr. Haygarth was consulted, in 1796, respecting a convulsive malady which prevailed in the island of Anglesey, and chiefly affected females. The symptoms were, a pain in the head or side, succeeded by violent twitchings or convulsions, during which the shoulders were nearly brought together. This disorder excited great alarm, and in the course of two or three months eighteen girls had become affected by it. Other instances are related in a pamphlet of Dr. Haygarth's, (On the Imagination as a Cause and as a Cure of Disorders of the Body; Exemplified by Fictitious Tractors and Epidemical Convulsions: 1800. See also Rees's Cyclopædia, article *Imitation*); and we shall not dwell longer on this part of the subject.

Before concluding our notice of the causes, we would observe, with respect to the cases of *hysteric asthma*, that, when the frequent connection between indigestion and asthma is considered, it will easily be supposed that the exciting cause of this particular form is often a disordered state of the stomach and bowels. But this complication is by no means invariable in hysteria; in which the asthma is often dependent on simple nervous irritation, produced by various causes; a fact which may be readily admitted when we recollect some of the nervous symptoms even of common asthma; the irritability preceding the attack, the urina profusa, the periodicity of the paroxysms. The nervous irritation may be of various origin: sometimes, doubtless, in the intestinal canal; often in the uterine system, particularly in the hysterical; and sometimes in impressions on the mind; the irritation being transmitted along the respiratory nerves with a facility which we only attempt to explain by referring to other instances of their prompt sympathies equally inexplicable.

The same observation may be extended to hysteric palpitation of the heart. No symptom more frequently arises from a disordered stomach than palpitation, and such may be its origin in some cases of hysteria. But the same system is a most familiar consequence of mental impressions, and of various other irritations; in all of which cases it is referred to the law of nervous sympathy. Few impressions capable of inducing nervous phenomena fail to produce palpitation; and sometimes it may be found that the paroxysm consists of palpitation; which perhaps takes a periodical form, with just so much of other hysterical symptoms as to create a suspicion of its real nature.

The headach, also, so commonly afflicting the hysterical, is known to be the commonest of all attendants on indigestion: it is also particularly common in females at the monthly periods. But it will undoubtedly often be found to occur in the hysterical as a direct consequence of nervous irritation; neither yielding to the remedies of indigestion, nor affected by the periodical functions of the uterus, nor relieved by repeated detractions of blood; indeed, sometimes much aggravated by the latter; but greatly mitigated, and sometimes banished very speedily and entirely, by what are called nervous medicines. We dwell on these apparent minutiæ because they are really of importance in practice; and because great attention to the real causes of the hysterical phenomena will often save much time, and spare the patient from the infliction of much unnecessary medicine.

There are circumstances connected with the hysteric headach, well known to all observers, but not easy to be explained. One is, the very common limitation of the pain to a small space above the eye. Sydenham was content to ascribe it to an "irregular motion of the spirits, in which all the spirits are collected in a certain point of the pericranium." It is easier to see the futility of this explanation than to furnish a better. Sydenham seems to have been much pleased with the solution, for he adds, — "and this contraction of all the spirits into a kind of point, differs little from the collection of the rays of the sun by a burning-glass; for as these burn by their united force, so those for the same reason cause a pain, by tearing the membranes with united violence." (Op. cit. p. 379.) The difficulty of giving a proper explanation of this peculiar pain is, however, not greater than that of accounting for the pain under the left breast in the tedious cases already described; and the pathologist is sometimes able to do no more than thus to escape one difficulty by pointing out another which is analogous to it. The intermissions and returns of the pain belong, in like manner, to many affections dependent on morbid conditions of the nervous system; and although, like them, sometimes occasioned by obvious recurring causes, are also sometimes as little understood as the paroxysms and intervals of neuralgia, of epilepsy, or of insanity.

Pathology of Hysteria. — Nearly all that can be properly said to have been ascertained respecting the pathology of hysteria has been incidentally spoken of in the foregoing description of the varieties of the disorder and of their various causes. The malady chiefly affects women, or men of a peculiar temperament, or whose constitutions have become enfeebled by intemperance, or by excessive study, or other causes capable of debilitating the nervous system, and of rendering its power of enduring impressions less than in the natural state. A nervous system thus susceptible by original constitution, or thus enfeebled, feels impressions more keenly, and responds to them more forcibly than is seen in firmer organizations, or in a state of perfect health, and, thus prepared, may be excited to disordered actions by numerous accidental causes. In the female system the exciting cause is very often an irritable or morbid condition of the uterine system. But, as this state of the uterine system appears to transmit an irritation from the uterine nerves to the nervous centre, which irritation is reflected from the centre to the nerves of other parts of the system; so similar irritations appear to arise, in other instances, from other extremities of the nervous system, and especially from the intestinal. In other cases, again, the nervous centres are more immediately irritated or disturbed. The reflected irritation, or that transmitted from the nervous centres, seems most readily to be conveyed to the nerves which preside over the motions of the intestines, and of the heart, and to those of respiration; parts and functions almost always the first seat of the hysterical phenomena. But the irritation may be more diffused; may affect the organs of locomotion and of sensation; and, partly from the specific irritation of the disorder, partly from the manner in which the circulation is affected, (for it is difficult in such a general disturbance to assign a specific cause to each separate phenomenon,) there is a complete loss of the power of moving, and a loss of sensibility and consciousness. It is very probable that the primary irritation of the nerves is soon attended with some alteration in the manner in which the circulation of blood is carried on in them; and the nervous centres may be similarly acted upon. As the disease is seldom fatal, the appearances which have been found after death have for the most part been the mere effects of long-continued disorder of organs from whence the primary irritations have arisen, as of the uterus and its appendages; but in other cases, in which death has supervened in the form of apoplexy upon the hysteric paroxysm, the disordered circulation in portions of the nervous system has been sufficiently manifest in the apoplectic appearances. A state of fulness, of congestion, or of sub-inflammation, in portions of the spinal marrow, may probably often exist. There is, however, every reason to believe that conditions of the nervous system, inconsistent with the proper performance of its functions, often exist without any palpable change in the quantity of blood circulating in the portions of it which are morbidly affected; and that in such cases the functional disorder may leave no visible trace of any kind. On the other hand, sudden and violent changes in the state of the circulation very commonly affect the functions of some part of the nervous system; and even gradual changes in the mere quantity of the blood induce or predispose to all the irritations of hysteria.

If we endeavour to be more precise as regards the exact nature and place of the nervous lesion, we can only be assisted by recollecting the symptoms of an irritated, injected, inflamed, or disorganized brain; and also that the spinal cord may be in like manner affected in any part of its length. It has been observed by pathologists, that when the upper portion of the cord is affected by disease, trismus, impairment of articulation, and deglutition, and oppression of the breathing, are produced; and that even palsy and death from asphyxia may ensue. When the cervical portion has been diseased, tetanic rigidity or convulsions of the muscles of the neck, or palsy of the muscles of the trunk, and paralytic weakness of the diaphragm have been noticed; and results little different have been found in examples of lesion of the dorsal portion. (*Craigie.* Elements of General Anatomy and Pathology, 1st edit. p. 429.) In cases in which the lumbar portion of the cord is diseased, the lower extremities are almost always paralysed; and first, there is retention, and eventually incontinence of urine and of the fæces. These facts, which may, perhaps, be considered as established, point in some degree towards the probable locality, though not very decidedly to the nature, of the irritation in some of the forms of hysteria.

That in all the cases, then, of hysterical disorder, there is a disordered state of some part or the whole of the nervous system, seems to be proved by all the phenomena, as well as by the causes which excite their appearance; but we see no reason to believe that there is always a state of vascular fulness, congestion, sub-inflammation, or any analogous condition of the blood-vessels. And, although the disorder of the nervous system may be, and very frequently is, induced by evident uterine irritation, it no less evidently arises, in other examples, from causes productive of irritation in other parts of the body, and also from causes acting directly upon the mind. If, however, we cannot concede to M. Villermay, that the ancient and revived doctrine of the invariable uterine origin of hysteria is true; neither can we agree with M. Georget to consider it, as Willis had done before, a simple disease of the brain; nor with Mr. Tate, that it is always produced by a morbid state of the spinal marrow, connected with the irregular performance of the functions of the womb.

The existence of an original susceptibility in excess in the nervous system of hysterical patients is an assumption warranted, we conceive, by all observation. The natural or congenital constitution of the nervous system, and even of different portions of it, is most plainly discerned to be different in different individuals. From the very cradle may be observed a different degree of sensibility to impressions; and even a different countenance, impressed by the hand of nature herself, before human feelings have written their deeper lines upon it; a countenance indicative of a distinct and individual character, which is associated with an individual mode of receiving and being affected by external circumstances, and of exercising the internal faculties upon the impressions received. As the individual being grows up, the results of the original organization, modified but not changed by education and various accidents, are observed in all the varieties between stupid insensibility on the one hand, and morbid or too ready excitement and activity on the other. The excitement and the activity are in different individuals more conspicuously manifested in different parts of the mixed system of body and mind. Thus, some are seen to be endowed with almost inexhaustible muscular energies, and some with vast powers of intellectual perception and combination; whilst in some the functions of the mind are feeble or disturbed, and in others divers other functions are debilitated or disordered. In the hysterical patient we may observe the most intense development of susceptibility, connected with a singular proneness to irregular actions, often arising from slight causes; the natural proportion designed to exist between the impressions of the external world and the sentient human system being in them not preserved.

The various impressions which thus become the causes of hysteria, (to confine our attention to this form of their effects,) if always supposed to act by nervous excitation, yet sometimes so readily and so early excite the circulation, and without the visible antecedence of any nervous change, that the phenomena *seem* to be referable to the vascular disturbance. The greater susceptibility of the nervous, or greater irritability of the vascular system, in different constitutions, exercises considerable influence. It would seem as if a mental impression, or a disordered state of the stomach, or the presence of worms, flatus, or acidity in the intestines, or a disturbed uterus, may in one case produce a direct nervous excitement, and in another act first on the heart and arteries, and, through disorder in them excited, lead to irritations in the brain and nervous system, and, lastly, through the irritation of the brain and nervous system, to disorder in several functions, different in different individuals; the respiratory organs being most affected in one, the intestines in another, the kidneys in a third, and the brain, (still a secondary effect,) in a fourth. The ultimate results are various; sobbing, or crying, or laughing in one case; in another, the hard and barking cough; in one, distension of the stomach and bowels, and globus; in another, diarrhœa or obstinate constipation; in one, copious urine, in another suppression; in one, confusion of mind, in another excessive caprice and love of change.

The links of such a disorder are too numerous to leave room for the affectation of laying down precise pathological rules as the measure of each case. Even another link must in some of the cases be added; for in the case of disordered stomach or bowels, for example, being the cause of the primary irritation which ends in the production of hysteria, that irritation itself, primary as it is with respect to the hysteria, is but secondary to some antecedent failure in the just performance of the vascular or nervous functions, or both, of the part in which such irritation first arises; and this failure itself may be occasioned by too great or too scanty a supply of blood, or too great or a deficient supply of nervous energy, or some other irregularity in the functions of one or both of these systems as relates to the constitution of the part the functions of which are first *seen* to be impaired. Yet it is upon a just consideration of some of these first links of a long chain that our best hope of a radical cure must in a great measure or wholly depend.

The object or final cause of all the diversified hysteric movements seems to be the equalization of the circulation of the blood, and the removal of an irritation of which the nervous system is conscious. We can recall no instance from our observation of convulsions excited without some intention, more or less obvious, to be effected in the general struggle. They commonly indicate the dominion of the irritated or pained brain, and are instinctive efforts for its relief; of which hysterical patients in particular sometimes express their own conviction.* It is justly remarked by the intelligent observer quoted below, that the muscles called into action in hysteria are chiefly those employed in *great* exertions.

Treatment.—We believe there are few disorders of which the practitioner generally undertakes the management with less willingness than hysteria. Its causes are so often obscure, or slight, and not to be wholly avoided, and its phenomena are so changeable and baffling under all kinds of treatment, that it is often left to itself, as a constitutional affection over which medicine has no power. Certainly very little benefit is to be expected from a bold and indiscriminate practice, and no immediate or striking results are to be looked for under the best considered plan of treatment; but those who take sufficient pains to ascertain the origin and complications of each case, and have perseverance enough to pursue a plan of treatment adapted to a chronic affection, and often requiring the whole health of the body and mind to be modified, will find that there are many cases, very unpromising at first sight, which may by such means be greatly relieved or wholly cured.

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* Ce sont les malades elles-mêmes qui donnent cette explication, comparent ce qui arrive dans cette circonstance à l'espèce de roideur générale que l'on oppose machinalment à toute sensation douloureuse, vive, et instantanée."—*Georget.*

Cases, assuredly, occasionally present themselves, so strange in their character, and so extensive in their complications, that the practitioner who has not been led to refer their almost innumerable symptoms to some general principle may imagine that they are only created to bewilder him and to discredit his art; and be to the last degree perplexed what plan of treatment to adopt, or with what measures to begin. Referring to the notes of a single case, not long ago seen by us, we find, contemporaneously existing, or at least complained of in a continuous catalogue detailed to the ear of the practitioner by a married female, of about thirty years of age,—headach; pain of ears and occasional deafness; frequent loss of voice; tightness of chest; dry, loud, sonorous, and very peculiar cough; dyspnœa; spasm about the throat, with blackness of the face supervening; pain of arms; palpitation; acute pain of the epigastrium, and sometimes in the left lumbar region; irregular appetite for food, and chiefly at night; costive bowels; very scanty and high-coloured urine, with copious whitish sediment, but sometimes abundant, and pale as water; menstruation quite suppressed, after being long defective; much pain of the lower part of the back; pain of the legs; disturbed sleep; great coldness and insensibility of the surface, particularly in the lower extremities, whilst heat applied to them produces mental excitement and a disposition to loud singing; the palpitations induced by exertion, as well as difficult breathing, cough, much agitation, and violent crying. Of such a case, a kind of epitome of all hysteric sufferings, the first view would seem to be most confused, and the first opinion most unfavourable. If the practitioner institutes a diligent search after local symptoms, he finds no satisfactory end to his search; and if he undertakes to prescribe for every symptom, as ndicative of some local affection, he exhausts the rt of prescription without success; new symp- oms arise when old ones yield, and he at length ives up the contest in despair.

To attain clear views of the proper arrangement f these and all other gradations of the malady, seems best, therefore, to speak of the treatment,— with reference to the paroxysm; 2. when hyste- a depends on causes of a general nature, as pletho-, or the opposite condition of various approaches anæmia, debility, &c.; 3. when connected with erine irritation; 4. with gastro-intestinal dis- der; 5. of the treatment of some particular mptoms; and, 6. of the preventive treatment in neral: we shall thus be enabled, without unne- ssary subdivisions, and without neglecting com- cations which no arrangement can simplify, to mprehend every practical consideration of im- rtance.

Treatment in the paroxysm.—During a fit of steria, the objects of all that can be done by the istants are, to guard the patient from avoidable injury, and to shorten the duration of the fit itself. The importance of both these objects depends, of course, a good deal upon the form of the paroxysm. When there are violent muscular agitations, the patient may be seriously injured without the care of those about her; and when much pain attends the fit, or when there is a deep coma or intense spasm, our anxiety must be greater to put an end to the attack.

All the details of the methods of restraint to be employed by the assistants may be resolved, whatever appearances of complexity may be given to them, into guarding the patient from injuring herself by her hands, by her teeth, or by striking the head and upper part of the body against any hard substances; and when these objects are gained, further restraint is useless, and perhaps hurtful; for the harmless although irregular actions which remain are to be considered as so many natural means of relief. The best way of guarding the patient from any injury from the teeth, is to put a napkin, several times folded, between them. According, however, to the degree of consciousness possessed by the patient, should the attendants endeavour, by firmness, calmness, and well-timed exhortations, to cause the person affected to exert her own power of self-control. For this purpose the operation of fear has sometimes been resorted to; and the success which has attended it shows that the patient is capable of being roused to exertion: but if sometimes successful, it is not always safe; violent convulsions have in some instances been occasioned by it, converting a quiet form of the disorder into one of an alarming aspect.

If the symptoms indicate a forcible determination of blood to the head, no attentions in the fit will more successfully mitigate the occasional convulsive actions than such as are directed to moderating such determination. The head may be raised, and towels wrung out of cold water applied to the forehead; warmth being at the time applied to the feet. All tight clothing about the neck or chest should be loosened. In the cases going on to complete coma, even venesection may be advisable. When there is less plethora of the vessels of the head, and the fit is obstinate, the patient being at intervals able to swallow, moderate quantities of stimulants are useful; as from half a drachm to a drachm of the spiritus ammoniæ aromaticus or fœtidus, or of the spiritus ætheris aromaticus or sulphurici compositus or nitrici, given in water, medicines which are more suitable than wine or brandy, because less permanent in their effects, and yet efficacious. Advantage may be obtained in slighter cases by sprinkling the face and chest with cold water, as recommended in the article Hydrocephalus for the relief of convulsions; and an abatement of the symptoms is often procured by applying stimulating scents to the nostrils, as common smelling salts: formerly, the smoke of assafœtida or of burnt feathers used to be much employed; and we have witnessed singular effects in some cases of slight convulsion from smelling common mint. More troublesome spasmodic paroxysms, frequently occurring in the fit, may render the addition of the tinctura opii, in doses of twenty or thirty drops, desirable. When the spasms are very severe, and especially when they assume the tonic form, there is commonly a degree of rigidity about the jaws which renders it difficult to administer medicine of any kind. In such circumstances the best effects are produced by enemata, particularly of assafœtida, of which one or two drachms may be so given; an ounce of the oleum terebinthinæ rectificatum is, perhaps, still more efficacious; we have seen complete resolution of rigid and apparently intractable spasm ensue in a few seconds after its administration in the enema domesticum: it is not necessary that the quantity of decoctum avenæ, which is the best vehicle, should be so great as when the object is to empty the colon; about ℥viii being sufficient. An enema of vinegar and water, or a mixture of these given by the mouth, are recommended by Riverius, (Praxis Medica,) for the suspension of the fit.

Little more can be done in the paroxysms. To *keep off* a paroxysm is always important; and it is sometimes accomplished by the prompt administration of ʒss. of the pulvis ipecacuanhæ, which we have also seen repeatedly successful in suspending the morbid actions of the paroxysm, especially in the croupal form described a few pages back. Extremes of heat or of cold have been remarked to bring on the paroxysms, (*Georget*). and should consequently be avoided as much as may be practicable. No effort should be left unmade to induce the patient to exert herself in *opposition* to the paroxysm: to resist it, as much as possible, by her will, and to feel pride in overcoming it. When any premonitory symptoms are perceived, cold water should immediately be applied to the head; and some of the stimulants already mentioned may be found prophylactic. Other parts of the preventive treatment will be mentioned afterward.

Treatment when dependent on plethora.—Cases of hysteria dependent on plethora may be complicated with defect in the uterine functions, with the suppression of some habitual discharge, or the retrocession of eruptions; and their relief is then to be principally expected from the re-establishment of the defective secretion, the restoration of a discharge to which the constitution has become too much habituated to endure its sudden cessation without derangement, or the solicitation to the skin of the eruption that has prematurely receded. Much more commonly, however, the plethoric condition of those subject to hysteric fits arises from neglect of exercise and from improper diet, and is best relieved by the general treatment of plethora, on which it is unnecessary here to expatiate. We have seen very good effects from one full bleeding; but the frequent repetition of venesection will not be well borne, and may even increase the susceptibility of the nervous system, and cause the continuance of the hysterical disorder in connection with the debility thus induced. The comatose or apoplectic form of hysteria will generally be found connected with too great fulness of the cerebral vessels, demanding careful attention, for such cases have proved fatal. Any immediate danger may be averted by taking away ten or twelve ounces of blood from the arm, or, what generally gives more decided relief, by cupping behind the neck, or rather between the shoulders, for the practitioner must not permit himself to disregard the indelible marks of the scarificators. The remaining disposition to cerebral plethora will be easily kept in check by applying a few leeches behind the ears once a fortnight, or every three or four weeks, and by causing the patient to take twice a week, in the morning, gr. ii of the submurias hydrargyri with ℈i or ʒss, or more, of the pulvis jalapæ compositus of the Edinburgh pharmacopœia, or a draught of infusum sennæ with two or three drachms of sulphas magnesiæ, and a drachm of the tinctura jalapæ. She should be directed to rise early, to take a tepid or cold shower-bath twice or thrice a week on getting up in the morning, or at night on going to bed: the diet should be moderate, and not consist of much fluid food, as broths, coffee, cocoa, tea, &c. Animal food should only be taken once a day. The patient should not indulge in late hours, nor lie on too soft a bed, nor in a close or confined apartment. Female servants have been rendered liable to hysteria in consequence of sleeping in rooms having no chimney; a fact which it may be useful to notice incidentally, although not directly connected with the subject of plethora. Walking exercise should be most strictly enjoined; the neglect of it is one of the chief causes of the general ill-health of women; they commonly neglect exercise for many days, and then take it to excess; suffer from the excess, and refrain from walking for many days more; and these ill-judged alternations it is very difficult to persuade them to abandon. The lamentable effects of the neglect of exercise have been pointed out in the article PHYSICAL EDUCATION: we believe that more attention is now paid to exercises and recreation in schools for young ladies than used to be the case a few years ago; and that the voluntary indolence of those who are not at school is much more general, and attended with the worst effects. The exercise taken by the patient will, of course, be various, according to her rank or situation in life: fortunately the best kind of exercise is the cheapest; and of all modes of exercise riding in a carriage is the worst, tending much more to induce than to avert a determination of blood to the head. As respects horse exercise we fully concur with Dr. Parry, who says, "with regard to riding on horseback, it is usually a mere apology for the want of that exercise which Providence evidently intended that man should take by means of his own limbs, and not those of another animal. Accordingly we find, that exclusively of the positive diseases which spring from this mode of gestation when violent, those who trust to its more moderate use, and more especially those who substitute it for accustomed bodily labour, are at least as subject to dyspepsia, gout, dropsy, hemorrhage, the whole train of nervous affections, mania, hysteria, epilepsy, paralysis and apoplexy, as those who lead the most indolent lives." (Op. cit. vol. ii. par. 31, 32.) The same experienced and enlightened physician reprobated in strong terms the mental weakness which was opposed to all voluntary exertions, and which in itself, as proceeding from the neglect of proper exercise, furnished a powerful argument against it. He admirably points out the evils of very warm rooms; of late hours, which always imply so much time taken from the day, and from the animating but little heeded effects of *light;* and all those indulgences for which climate or fashion furnish so many apologies. And he notices the instructive fact that various animals dependent on man, and treated with similar indulgence, incur similar penalties. "Thus singing-birds and lap-dogs, which are confined and highly fed, are subject to the whole train of nervous affections; as palpitation of the heart, breathlessness on slight motion, *hysteria,* convulsions, epilepsy, hemiplegia, and apoplexy."

When, by inducing better habits in these respects, and taking the immediate measures already pointed out, the plethoric condition is so far reduced as to obviate the occurrence of any inconvenience from the use of antispasmodic medicines, these may be variously employed, in combination with counter-irritation along the spine, and other measures which we shall have to mention after considering the next class of cases.

Treatment of cases dependent on various degrees of Debility.—Our classification must not exclude from our reader's mind those cases, not of unfrequent occurrence, in which the state of debility is conbined with the state of plethora, and which require a judicious combination of several parts of the plan above laid down with that now to be mentioned.

When the general nervous susceptibility, and consequent hysteria on the supervention of slight occasional causes, are not connected with plethora or with vascular excitement of a general kind, venesection, low diet, and saline purgatives, or such as produce watery discharges from the bowels, may exceedingly increase the tendency to the disorder. Local vascular excitement in the brain, for example, or in some portion of it, or of the spinal cord, may require and be benefited by local depletion, and be relieved by external irritations, by means of blisters or the tartar-emetic ointment; but the general measures must be of a different kind. Medicines which increase the patient's strength will here be found to diminish the susceptibility of the nervous system to impressions; but they require to be given with peculiar cautions, for patients of the kind now alluded to generally profess an inability to take any tonic medicine without incurring headach, feverishness, and uncomfortable excitement. Their objections to all medicines in which they detect a bitter taste are uncommonly insurmountable; and the practitioner is precluded from the employment of the cinchona, cascarilla, calumba, and gentian, although some of these might really be serviceable. In such cases the best resource is found in the diluted sulphuric acid, of which seven or ten drops given in the infusum rosæ compositum, with a drachm of the compound tinctura cardamomi, will be found to form a grateful medicine, which the patient may take twice or thrice in the four-and-twenty hours with great advantage: the addition of mxv or xx of the tinctura hyoscyami will usefully allay any excess of nervous irritation. If the patient is found, as frequently happens, to make objections to chalybeate tonics, the objections will commonly be avoided by giving these most useful medicines in very small doses, without any sacrifice of their good effects. If the diluted sulphuric acid is given in distilled water, half a grain or a grain of the sulphate of iron may be given in the draught: even a quarter of a grain or less, given in this manner, is productive of good effects: if more is deemed necessary, gr. ii may be given in a pill with the extractum anthemidis, or the extract of gentian, night and morning. If the tinctura ferri muriatis can be taken without inconvenience, it may be given in doses of from seven to ten drops twice a day. We have generally found these forms of medicine less objected to by patients than the mistura ferri composita, although the compound iron pill is taken without complaint, and in doses of eight or ten grains twice a day is a valuable tonic. Of the vinum ferri we have little experience; but this or the mistura ferri may be given so as to avoid any real or supposed inconvenience to the patient, in combination with the decoctum aloes compositum; a combination which may be especially useful when it is desired to promote the activity of the bowels, or to excite the periodical functions of the uterus. The most delicate females can generally take the sulphate of zinc or the oxyde, in doses of a grain twice a day in the form of pill, with some bitter extract, without difficulty; and we are much disposed to think that the general effect of the mineral tonics will be most satisfactorily perceived when they are given in these moderate doses. We give this opinion as the result of our own observation; but it is only reasonable to suppose that more advantage is gained by attempting the gradual invigoration of the functions, than by suddenly calling on the organs for actions of which the vehemence is disproportioned to their power. Whytt mentions a case in which two hundred and thirty grains of the filings of iron were given daily, divided into three doses, for some months together, in a case of indigestion. The carbonate of iron has also been lately given, as is well known, in enormous quantities; but this kind of treatment does not appear to us to be at all suitable to cases of hysteria. It does not seem that the natural mineral waters of Bath, which formerly enjoyed much reputation in nervous disorders, have of late years been much resorted to by nervous, or at least by hysterical patients; a fact of which we are assured by an obliging communication from Dr. Barlow, but which we have learnt with some surprise. If due care was taken to recommend their use in cases where the hysterical affection was connected with a debilitated constitution, we cannot doubt that it would be attended with great advantage. But the real merits of mineral waters are often lost in a meretricious fame: whilst fashion dictates their employment, they are used indiscriminately; and when the fickleness of fashion leaves them unpatronised, their good effects are no longer thought of.

The warm sulphureous waters of Cauterets and Bagnaules (Bagnoles) are mentioned by Sauvages as being useful in hysterica chlorotica. About four pints are directed to be drunk daily for three days, and a bath is to be taken on the fourth; and the use of the waters and the bathing are to be thus continued for a month. Those of Seltzer, Spa, Vichy, Barèges, Pyrmont, and Carlsbad, have been recommended.

Sydenham had great confidence in the effects of a milk diet in cases of great debility. He also thought highly of the infusion of various bitters in canary wine, and says that he sometimes advised hysteric women to drink a large draught of canary by itself at bedtime for some nights in succession, and that they were eminently relieved by it, "the whole body having been much strengthened, and such as were before cachectic becoming fresh-coloured and brisk thereby." He also very strongly recommends horse exercise.

To the ammoniatum cupri and nitras argenti, which have sometimes been given on account of their possessing not only a tonic property, but a specific power of allaying nervous irritability, we have never had recourse in hysteria. With the intention of improving the general health, we should especially recommend either the tepid shower-bath of sea-water or of salt and water every other morning; or the sponging of the greater part of the whole of the surface of the body with salt and water every morning. The warm sea-bath may be useful, or, if the patient can bear it, bathing in the open sea.

Change of climate, even within our own island, may become an object of consideration, by way of avoiding extremes of heat or cold. No medical practitioner of observation is now sceptical concerning the effects of changes of weather as well as of climate. We would ourselves generally undertake to predicate, from the actual state of the weather, the situation in which we should find patients of known susceptibility to impressions, or nervousness; and have often noticed their especial discomfort in warm and showery seasons, their continued indisposition in low, sheltered, warm residences, and their as certain relief when removed to a hilly locality. Some of these effects are perhaps accounted for by the variable weight of the atmosphere in various seasons, its lightness always seeming to produce oppression by permitting the expansion of the circulating fluids, except in particular constitutions, to whom such expansion seems to be suitable; other effects may be the mere result of temperature on the nervous substance; and some we should be inclined to ascribe to electrical variations which have not yet received adequate attention.

The refreshing air of Malvern, of the heights of Clifton, or that of the northern parts of the island, may be useful in the warmer seasons. Of that of Malvern we can speak confidently, as regards its surprising effects on pale languid females, whose appearance and health begin to improve almost as soon as they remove thither; it has this great advantage, also, that it may be enjoyed without exposure to the dissipations which seem to form an essential part of a fashionable watering-place. It is mortifying to observe how frequently weak and nervous patients, relying on a succession of medicines without end, neglect, in spite of every exhortation and every indication of reason, the best tonic and nervous medicine of all, and one which they can always procure by slight exertion—we mean the cool and pure air of the earlier hours of the day. If they cannot deny the unfavourable influence of passing twelve hours out of every twenty-four in the close atmosphere of a bed-room, the conviction has seldom any effect upon their habits. To supply the strength thus lost, recourse is had to various stimulants, and the result is often the total destruction of health and comfort, and the conversion of all the years after forty into "a long disease."

The effect of various impressions on the mind is always to be considered in cases of benefit derived from change of air. A sea-voyage, therefore, or a journey attended with many incidents, and with some difficulties, has sometimes been found to be very serviceable. The wives of officers, delicate and hysterical in the languor of country quarters, have lost their complaints amidst the fatigues or dangers of a march. The ladies of Paris forgot their hysterical affections, we are told, in the French revolution; and the Irish ladies in the rebellion, although exposed to many and violent impressions. Cullen noticed similar effects in the ladies of Scotland in the civil war of 1745-46; and Dr. Rush, in a curious paper "On the Influence of the American Revolution on the Human Body," says that many hysterical women, who were much interested in the successful issue of the contest, "were restored to perfect health by the events of the time, change of place, occupation," &c. (Medical Inquiries and Observations, vol. i. Philadelphia and London, 1794.) Dr. Parry has recorded some remarkable instances illustrative of the same principle; (Posth. Works, vol. i. p. 368–9.) and Dr. Bright observes that a severe nurse in a ward will sometimes cause hysterical disorders to be less inveterate there than in other wards. (Op. cit.)

Ease and indulgence seem always to exasperate this disorder. The daughters of cottagers removed to the kitchens of people in comfortable circumstances, often become hysterical. The wives of merchants, Frank remarks, are affected with hysteria in flourishing times; but when reverses come, they "have no time to be ill." (Op. cit. cap. xiv.)

In both classes of cases the treatment of which has now been spoken of, periods occur in which neither the proper remedies for plethora, nor those usually suitable to states of mere debility, will do all that is required. The plethoric tendency may be controlled, and the susceptibility, the tendency to irregular and spasmodic actions, yet remain; and the same may be the case both where every thing has been done to counteract debility, and where the patient, although manifestly weak, cannot bear many of the usual means of restoring the strength. It is in these cases that a watchful practitioner will find periods in which anti-hysteric, or antispasmodic, stimulant, or sedative medicines may be prescribed with the happiest results. We do not here allude so much to opium, henbane, conium, and medicines of that description, which are generally only given with temporary advantage in cases of hysteria; but to assafœtida, musk, valerian, and other means which appear to be not only antispasmodic, but directly to decrease the morbid susceptibility of the nervous system. First in the list we should place the gummi resina assafœtida, the chief of those "fetid medicines" which, in the language of Sydenham, "are calculated to compose the tumultuary motion of the spirits," and were therefore anciently called *hysterics*. The assafœtida is, indeed, a medicine which we have found particularly useful; and, if the patient will submit to take a very nauseous mixture, the mistura assafœtidæ (the old *milk* of assafœtida) is perhaps the most efficacious form in which it can be given. Each ounce of this mixture contains gr. xv. of the gum resin, and either ℥i or ℥ss may be given three or four times a day, in cases in which the patient is subject to very frequent attacks. It is, however, often necessary to give this disagreeable medicine in pills: in either form much confidence may be placed in it. If genuine musk could commonly be procured, its prescription in doses of gr. xv three times a day would probably be equally or even more efficacious: it is certainly a valuable medicine. The mistura moschi of the pharmacopœia, containing in each ℥iss of aq. rosæ gr. xv of musk, is one of the most convenient formulæ for the use of the practitioner. The utility of both the assafœtida and the musk will be the most conspicuous in cases in which the surface is pale and the pulse languid. The castoreum has been much recommended; and the tincture, and still more the compound tincture of the Edinburgh pharmacopœia, in which it is combined with assafœtida, may be usefully added to other medicines in doses of one or two drachms. The effects of valerian are occasionally very striking. Idiosyncrasies seem to exist, which render different anti-hysteric medicines of paramount service in different cases; and in some of the forms of hysteria the valerian is a specific. As many patients cannot bear the powder, the infusum valerianæ of the pharmacopœia of Dublin may be conveniently prescribed; we are ourselves most familiar with its effects in the form of the tinctura valerianæ ammoniata; and particularly in the hysteric headach, to be presently spoken of. The oleum succini has sometimes been recommended in hysteria, but we do not think that either in its simple form, or in that of the spiritus ammoniæ succinatus, it is now much employed.

[Dracontium and creasote have likewise been used in the same cases; but they are not possessed of any powers, which should give them a preference over the articles already mentioned.]

Although we feel convinced that there are, as we have said, periods in almost all cases in which antispasmodics are most serviceable, there are no medicines which will more surely disappoint the practitioner who trusts entirely to them, or employs them indiscriminately. In many cases it must be remembered that the means of reducing vascular action, or, on the other hand, the means of improving the general strength, are the best antispasmodics, and more truly anti-hysteric than any specifics which can be employed.

The restless nights and various uneasy feelings of hysterical patients make it in many cases absolutely necessary to have recourse to anodynes. The extracts of hyoscyamus and conium, with camphor; the tinctura opii, or tinctura camphoræ composita; the acetate or muriate of morphia, the liquor opii sedativus, the Dover's powder, or opium alone, will be suitable in different circumstances: but the disposition of hysterical patients to continue the use of these medicines, and to take them in large quantities, should be carefully discouraged.

Treatment of cases dependent on uterine disorder.—Independently of all the parts of the general treatment of hysteria, these cases require especial attention, different according to the precise disorder existing in the uterus. If amenorrhœa is present, which we have stated that we consider *not* a very common circumstance, the practitioner must have recourse to the proper treatment as described under that head. (See AMENORRHŒA.) If, as more frequently happens, there is too frequent or too copious menstruation, a form of disease in young females which is even more difficult to be managed, attention to the general health will be found the most important; although sometimes astringent medicines are decidedly useful. We have known marked advantage derived from taking six or eight grains of the pulvis kino compositus with a few grains of alum two or three times a day; but when medicines of this kind are given, the supervention of headach, with a hot and dry skin and feverishness, will sometimes compel their discontinuance. There is usually in such cases what may be termed an irritable state of the uterus, indicated by pain in the hypogastric region, in the sacrum, along the upper edge of the ossa ilia, and down the thighs; with leucorrhœa, and a quick and feeble pulse: the os uteri is tender to the touch, and there is a disposition to organic disease: the digestive organs are almost always in these instances considerably disturbed. Cupping on the loins, leeches to the epigastric region, or to the vagina or the os uteri itself, anodyne enemata, fomentations, rest in the horizontal position, the frequent use of the hip-bath, and temporary separation a marito, and a most careful avoidance of irritating purgatives, are among the measures most to be recommended in such cases. For the addition of anti-hysteric or tonic remedies no rules can be laid down; the judgment of the practitioner must entirely regulate their administration in each case: they will often be found necessary even when the uterine irritation is relieved.

Some of the French practitioners lay more stress than we are accustomed to do in this country on particular articles of diet, and substances introduced in enemata, in occasioning uterine excitement and hysteria. Crabs, mussels, onions, truffles, aromatic chocolate, vanilla, and cinnamon, are enumerated by M. Louyer Villermay as having these effects; and he adds *perhaps* strawberries and raspberries, but more certainly too nourishing, spiced, and heating aliments, wines, spirits, and every excess. He further mentions pastilles, into the composition of which the powder or tincture of cantharides enters; and also enemata of drastic, irritating, and poisonous plants, which he says have often caused nymphomania with convulsions, terminating in death. (Dictionnaire de Médicine, Art. *Hystérie.*)

Treatment of cases dependent on gastro-intestinal disorder.—These cases may require little more than the simple treatment of indigestion (for which we refer the reader to the article INDIGESTION) as preparatory to the administration of antispasmodic medicines. If there is much tension of the abdomen, with uneasiness, and some tenderness on pressure, the cure will be very much hastened by the application of from six to twelve leeches to the epigastrium. This practice, recommended by Dr. Wilson Philip in particular stages of indigestion, we have seen the immediate advantage of in innumerable instances; constantly observing the utility of medicines after such application, which had been fruitlessly persevered in before. If the lower part of the abdomen is tumid thought highly of the infusion of various bitters in canary wine, and says that he sometimes advised hysteric women to drink a large draught of canary by itself at bedtime for some nights in succession, and that they were eminently relieved by it, "the whole body having been much strengthened, and such as were before cachectic becoming fresh-coloured and brisk thereby." He also very strongly recommends horse exercise.

To the ammoniatum cupri and nitras argenti, which have sometimes been given on account of their possessing not only a tonic property, but a specific power of allaying nervous irritability, we have never had recourse in hysteria. With the intention of improving the general health, we should especially recommend either the tepid shower-bath of sea-water or of salt and water every other morning; or the sponging of the greater part of the whole of the surface of the body with salt and water every morning. The warm sea-bath may be useful, or, if the patient can bear it, bathing in the open sea.

Change of climate, even within our own island, may become an object of consideration, by way of avoiding extremes of heat or cold. No medical practitioner of observation is now sceptical concerning the effects of changes of weather as well as of climate. We would ourselves generally undertake to predicate, from the actual state of the weather, the situation in which we should find patients of known susceptibility to impressions, or nervousness; and have often noticed their especial discomfort in warm and showery seasons, their continued indisposition in low, sheltered, warm residences, and their as certain relief when removed to a hilly locality. Some of these effects are perhaps accounted for by the variable weight of the atmosphere in various seasons, its lightness always seeming to produce oppression by permitting the expansion of the circulating fluids, except in particular constitutions, to whom such expansion seems to be suitable; other effects may be the mere result of temperature on the nervous substance; and some we should be inclined to ascribe to electrical variations which have not yet received adequate attention.

The refreshing air of Malvern, of the heights of Clifton, or that of the northern parts of the island, may be useful in the warmer seasons. Of that of Malvern we can speak confidently, as regards its surprising effects on pale languid females, whose appearance and health begin to improve almost as soon as they remove thither; it has this great advantage, also, that it may be enjoyed without exposure to the dissipations which seem to form an essential part of a fashionable watering-place. It is mortifying to observe how frequently weak and nervous patients, relying on a succession of medicines without end, neglect, in spite of every exhortation and every indication of reason, the best tonic and nervous medicine of all, and one which they can always procure by slight exertion—we mean the cool and pure air of the earlier hours of the day. If they cannot deny the unfavourable influence of passing twelve hours out of every twenty-four in the close atmosphere of a bed-room, the conviction has seldom any effect upon their habits. To supply the strength thus lost, recourse is had to various stimulants, and the result is often the total destruction of health and comfort, and the conversion of all the years after forty into "a long disease."

The effect of various impressions on the mind is always to be considered in cases of benefit derived from change of air. A sea-voyage, therefore, or a journey attended with many incidents, and with some difficulties, has sometimes been found to be very serviceable. The wives of officers, delicate and hysterical in the languor of country quarters, have lost their complaints amidst the fatigues or dangers of a march. The ladies of Paris forgot their hysterical affections, we are told, in the French revolution; and the Irish ladies in the rebellion, although exposed to many and violent impressions. Cullen noticed similar effects in the ladies of Scotland in the civil war of 1745–46; and Dr. Rush, in a curious paper "On the Influence of the American Revolution on the Human Body," says that many hysterical women, who were much interested in the successful issue of the contest, "were restored to perfect health by the events of the time, change of place, occupation," &c. (Medical Inquiries and Observations, vol. i. Philadelphia and London, 1794.) Dr. Parry has recorded some remarkable instances illustrative of the same principle; (Posth. Works, vol. i. p. 368–9,) and Dr. Bright observes that a severe nurse in a ward will sometimes cause hysterical disorders to be less inveterate there than in other wards. (Op. cit.)

Ease and indulgence seem always to exasperate this disorder. The daughters of cottagers removed to the kitchens of people in comfortable circumstances, often become hysterical. The wives of merchants, Frank remarks, are affected with hysteria in flourishing times; but when reverses come, they "have no time to be ill." (Op. cit. cap. xiv.)

In both classes of cases the treatment of which has now been spoken of, periods occur in which neither the proper remedies for plethora, nor those usually suitable to states of mere debility, will do all that is required. The plethoric tendency may be controlled, and the susceptibility, the tendency to irregular and spasmodic actions, yet remain; and the same may be the case both where every thing has been done to counteract debility, and where the patient, although manifestly weak, cannot bear many of the usual means of restoring the strength. It is in these cases that a watchful practitioner will find periods in which anti-hysteric, or antispasmodic, stimulant, or sedative medicines may be prescribed with the happiest results. We do not here allude so much to opium, henbane, conium, and medicines of that description, which are generally only given with temporary advantage in cases of hysteria; but to assafœtida, musk, valerian, and other means which appear to be not only antispasmodic, but directly to decrease the morbid susceptibility of the nervous system. First in the list we should place the gummi resina assafœtida, the chief of those "fetid medicines" which, in the language of Sydenham, "are calculated to compose the tumultuary motion of the spirits," and were therefore anciently called *hysterics*. The assafœtida is, indeed, a medicine which we have found particularly useful; and, if the patient will submit to take a very nauseous mixture, the mistura assafœtida (the old *milk* of assafœtida) is perhaps the most efficacious form in which it can be given. Each ounce of this mixture contains gr. xv. of the gum resin, and either ℥i or ℥ss may be given three or four times a day, in cases in which the patient is subject to very frequent attacks. It is, however, often necessary to give this disagreeable medicine in pills: in either form much confidence may be placed in it. If genuine musk could commonly be procured, its prescription in doses of gr. xv three times a day would probably be equally or even more efficacious: it is certainly a valuable medicine. The mistura moschi of the pharmacopœia, containing in each ℥iss of aq. rosæ gr. xv of musk, is one of the most convenient formulæ for the use of the practitioner. The utility of both the assafœtida and the musk will be the most conspicuous in cases in which the surface is pale and the pulse languid. The castoreum has been much recommended; and the tincture, and still more the compound tincture of the Edinburgh pharmacopœia, in which it is combined with assafœtida, may be usefully added to other medicines in doses of one or two drachms. The effects of valerian are occasionally very striking. Idiosyncrasies seem to exist, which render different anti-hysteric medicines of paramount service in different cases; and in some of the forms of hysteria the valerian is a specific. As many patients cannot bear the powder, the infusum valerianæ of the pharmacopœia of Dublin may be conveniently prescribed; we are ourselves most familiar with its effects in the form of the tinctura valerianæ ammoniata; and particularly in the hysteric headach, to be presently spoken of. The oleum succini has sometimes been recommended in hysteria, but we do not think that either in its simple form, or in that of the spiritus ammoniæ succinatus, it is now much employed.

[Dracontium and creasote have likewise been used in the same cases; but they are not possessed of any powers, which should give them a preference over the articles already mentioned.]

Although we feel convinced that there are, as we have said, periods in almost all cases in which antispasmodics are most serviceable, there are no medicines which will more surely disappoint the practitioner who trusts entirely to them, or employs them indiscriminately. In many cases it must be remembered that the means of reducing vascular action, or, on the other hand, the means of improving the general strength, are the best antispasmodics, and more truly anti-hysteric than any specifics which can be employed.

The restless nights and various uneasy feelings of hysterical patients make it in many cases absolutely necessary to have recourse to anodynes. The extracts of hyoscyamus and conium, with camphor; the tinctura opii, or tinctura camphoræ composita; the acetate or muriate of morphia, the liquor opii sedativus, the Dover's powder, or opium alone, will be suitable in different circumstances: but the disposition of hysterical patients to continue the use of these medicines, and to take them in large quantities, should be carefully discouraged.

Treatment of cases dependent on uterine disorder.—Independently of all the parts of the general treatment of hysteria, these cases require especial attention, different according to the precise disorder existing in the uterus. If amenorrhœa is present, which we have stated that we consider *not* a very common circumstance, the practitioner must have recourse to the proper treatment as described under that head. (See AMENORRHŒA.) If, as more frequently happens, there is too frequent or too copious menstruation, a form of disease in young females which is even more difficult to be managed, attention to the general health will be found the most important; although sometimes astringent medicines are decidedly useful. We have known marked advantage derived from taking six or eight grains of the pulvis kino compositus with a few grains of alum two or three times a day; but when medicines of this kind are given, the supervention of headach, with a hot and dry skin and feverishness, will sometimes compel their discontinuance. There is usually in such cases what may be termed an irritable state of the uterus, indicated by pain in the hypogastric region, in the sacrum, along the upper edge of the ossa ilia, and down the thighs; with leucorrhœa, and a quick and feeble pulse: the os uteri is tender to the touch, and there is a disposition to organic disease: the digestive organs are almost always in these instances considerably disturbed. Cupping on the loins, leeches to the epigastric region, or to the vagina or the os uteri itself, anodyne enemata, fomentations, rest in the horizontal position, the frequent use of the hip-bath, and temporary separation a marito, and a most careful avoidance of irritating purgatives, are among the measures most to be recommended in such cases. For the addition of anti-hysteric or tonic remedies no rules can be laid down; the judgment of the practitioner must entirely regulate their administration in each case: they will often be found necessary even when the uterine irritation is relieved.

Some of the French practitioners lay more stress than we are accustomed to do in this country on particular articles of diet, and substances introduced in enemata, in occasioning uterine excitement and hysteria. Crabs, mussels, onions, truffles, aromatic chocolate, vanilla, and cinnamon, are enumerated by M. Louyer Villermay as having these effects; and he adds *perhaps* strawberries and raspberries, but more certainly too nourishing, spiced, and heating aliments, wines, spirits, and every excess. He further mentions pastilles, into the composition of which the powder or tincture of cantharides enters; and also enemata of drastic, irritating, and poisonous plants, which he says have often caused nymphomania with convulsions, terminating in death. (Dictionnaire de Médicine, Art. *Hystérie.*)

Treatment of cases dependent on gastro-intestinal disorder.—These cases may require little more than the simple treatment of indigestion (for which we refer the reader to the article INDIGESTION) as preparatory to the administration of antispasmodic medicines. If there is much tension of the abdomen, with uneasiness, and some tenderness on pressure, the cure will be very much hastened by the application of from six to twelve leeches to the epigastrium. This practice, recommended by Dr. Wilson Philip in particular stages of indigestion, we have seen the immediate advantage of in innumerable instances; constantly observing the utility of medicines after such application, which had been fruitlessly persevered in before. If the lower part of the abdomen is tumid and uneasy, the leeches may with more advantage be applied to the orifice of the rectum. But this tenderness is by no means constant in hysterical cases; and the distension of the abdomen is seldom permanent, but rather comes on and subsides with some suddenness, and is then shown by many symptoms to be dependent on flatus. Temporary relief may be obtained in the attacks from carminatives; as the compound tincture of cardamoms in aqua menthæ piperitæ, aqua carui, or aqua cinnamomi, or a little spiritus ætheris aromatici in camphor mixture; or even a few drops of the oleum carui on sugar. The importance of giving relief in these attacks of flatus depends less on their severity, although that is considerable, than on their tendency to induce the hysteric paroxysm. The measures from which we have seen the most permanent efficacy are the administration of the warm gums and purgatives at night, or night and morning, and of bitter medicines with an alkali twice a day; with strict attention to diet and to clothing. Eight or ten grains of the pilulæ aloes et assafœtidæ of Edinburgh, or equal parts of the compound extract of colocynth and of the pilulæ galbani compositæ, have seemed to be of essential service: the inactivity of the bowels often requires an aperient draught to be given in the morning; in which case the decoctùm aloes compositum is preferable to salts and senna. Whytt recommends pills of assafœtida, extract of aloes, and sulphate of iron: we have found pills of the sulphate of iron, extract of aloes, and extract of gentian, very beneficial: the tinctura muriatis ferri, or a draught of equal parts of infusum gentianæ compositum and aqua menthæ, with the carbonate of potass or of soda, twice a day, are also useful. The state of the stomach and bowels is often improved by giving small alterative doses of the pilula hydrargyri; but the practitioner should never forget that although nervous patients are more than all others sensible of the immediate relief derived from taking a dose of the blue pill or of calomel, there are none on whom the penalties of taking these medicines too often or in excess, are more certainly and more painfully exacted, in the shape of increased nervous susceptibility, which may thus indeed be exasperated to the extremest sensitiveness, and even to madness.

External applications, in the form of emplastra, are perhaps too little regarded in modern practice; we are persuaded that much benefit is sometimes obtained by the application of a good-sized emplastrum galbani compositum to the abdomen, as well as occasionally by a mercurial plaster. A broad bandage of flannel is sometimes useful, and the daily use of the flesh-brush and friction. We have not found any form of bathing very serviceable in this description of cases.

Attention to the diet of these patients is of great importance: they generally find it necessary to avoid fluids and vegetables, except in small quantities. Moderate meals, at regular and sufficient intervals, should be recommended to them, rest in the horizontal position for an hour after eating, and afterwards exercise: a glass or two of sherry after dinner will generally be found useful to them, or small quantities of brandy and water. Porter, ale, and beer, seldom agree with them. One of the benefits of not drinking at dinner, a rule in itself not warranted by natural instinct, is that it causes the patient to eat less: large draughts of beer or soda-water are decidedly improper.

If there is reason to suppose that the hysteria is almost wholly dependent on confined bowels, the continued use of the compound aloetic pills will perhaps be found more productive of relief than the most complicated treatment which can be devised. Large and unsuspected collections of fæcal matter are frequently lodged in the colon, and remain or re-accumulate, unless the practitioner perseveres in the treatment calculated to remove them.

When the hysteria is connected with the presence of worms in the stomach or bowels, recourse may be had to anthelmintics: except in the case of tænia, however, against which the oleum terebinthinæ may almost be said to be infallible, the best vermifuges will be found in the means already detailed.

Among the complications of hysteria we have already mentioned that of the intestinal with uterine irritation; and the cases which we have just described will often be found to be considerably aggravated at the menstrual periods. We are convinced, however, that in many such examples the uterine irritation is neither first in order nor in importance. No sequence is, in fact, more familiar in pathology than that of irritation of other mucous membranes supervening on that of the intestinal canal.* The vehement pulsation of the aorta, which was also mentioned, sometimes depends on intestinal disorder.

Treatment of particular symptoms.—Concerning these it will not be necessary that much should be added to what has already been laid down respecting treatment; but the practitioner will be disappointed if he looks for the retreat of some of these troublesome complaints even when attacked according to all the rules of art. Theoretical writers, vain of their science, but unversed, as it would appear, in the perplexities of practice, are too ready to deride empirical modes of relief, and to believe that their general maxims are all-comprehensive. Thus M. Louyer Villermay, maintaining the uterine theory, disregards the condition of other organs; and M. Georget, treating the uterine theory with ridicule, asserts that as hysteria is a disease of the brain, it is idle to prescribe for the stomach, or the heart, or the lungs; and seriously advises "pills of crumbs of bread and other substances of like energy, and for drink, water and tisanes of equal virtue." Whoever sees much of hysteria will soon become satisfied that such practices would be singularly useless, and that even when every general means has been attended to, there are particular attentions which cannot be neglected without disadvantage.

The hysterical headach is best relieved by the tinctura valerianæ ammoniata in doses of ʒss, with an equal quantity of sp. æth. sulph. comp., or of sp. lavand. comp., or of the tincture of hyoscyamus, in camphor mixture. A drachm of the simple tincture of valerian, and ten or fifteen drops of acidum sulphuricum dilutum, taken twice a day, with or without ʒi of the tincturæ cinchonæ, is also a useful medicine. The application of cold to the head, the frequent use of the shower-bath, and of pediluvia of warm water, may be resorted to with benefit. Although blisters behind the ears are in these instances, and in those of hysterical pains about the face, usually productive of much temporary irritation, their employment is often followed by relief. In very obstinate pains, as in nearly all obstinate chronic disorders, a gentle course of mercury has occasionally proved useful. (*Whytt.*)

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* The reader is referred for an illustration of this important principle to the article ASTHMA, vol i. p. 216

For the relief of those cases in which the symptoms of phrenitis are simulated, rest, quietness, opiates, and, according to circumstances, purgatives, and the usual means of equalising the circulation, will generally be found efficacious; and stronger measures are not hastily to be resorted to.

In the hysteric asthma, in addition to the ordinary treatment of cases in which there is much nervous irritability, the patient may take pills of equal parts of ammoniacum and squill, or of ammoniacum and assafœtida. Dr. Whytt recommends equal parts of the two latter in aqua pulegii. We have seen evident relief from plasters of assafœtida and ammoniacum applied to the chest. These cases also often require particular attention at the monthly periods, when small doses of the sulphate magnesiæ, with tincture of hyoscyamus, given in the mistura camphoræ, will sometimes be found to ward off threatening symptoms.

Of all forms of hysteria none are so obstinate as those attended with pain in the left side. We have not found it so constantly connected with tenderness of the spine, nor so uniformly dependent on uterine disorder, as Mr. Tate seems to have done. As regards all local treatment of the side itself, we believe it to be a mere waste of time; nor can we speak with much confidence of medicines. We have generally found it difficult, sometimes impossible, to produce proper counter-irritation in the side; but, on the whole, have seen more advantage gained from repeated applications of the tartar-emetic ointment to the spine than from any other means. After many trials, we prefer using ointment of the strength of a drachm of the antimonium tartarizatum to ʒii, or ʒiii, of cerate; one application, the part being previously sponged with hot vinegar, being often sufficient to produce numerous small pustules, by the repeated evocation of which we have thought the patient much more benefited than by the same counter-irritant applied as a plaster or in any other degree of strength. In our experience, the advantage derived by the patient from the use of this ointment is not generally increased in proportion to the suffering it occasions. Leeches, and a succession of small blisters to the spine, are sometimes still more serviceable than the ointment.

These cases are very unsatisfactory. The patient sometimes continues an invalid for one or two years, and at length recovers without appearing to be under much obligation to medicine; or sinks into a state of atrophy, hardly able to take any nourishment, a prey to every morbid feeling, and a burden to herself and to all about her.* The tenderness of the dorsal spine and the pain about the sacrum have been accurately pointed out by Mr. Tate, who has also given some very striking cases in which relief followed his practice in them. Dr. Darwall had previously called the attention of the profession to the tenderness and spinal irritation, and Mr. Griffin has published some interesting cases of it in the London Medical and Physical Journal. Mr. Tate apprehends that the accompanying pain in the side is seated in the intercostal nerve; although he says he has sometimes thought it must be situated in the nerves of the heart itself. The right side, however, is occasionally the seat of suffering; and we have not observed that the pain, even when in the left side, was often attended with palpitation: a sense of weight is very commonly complained of. We have proposed acupuncturation with sanguine expectations of success, which have ended in disappointment. In one case we noticed complete relief ensuing on the coming out of a vesicular eruption in the situation of the pain, and in another on the appearance of an ovoid tumour, which subsequently subsided without suppuration. Dr. Whytt, to prove that "complaints of the nervous or hysteric kind often proceed from some morbid humour in the blood," adduces cases in which "an itching between the toes, red pustules appearing on the breast and belly, or some other cutaneous eruption," produced relief. (Op. cit. chap. iv.) Much of the difficulty in these peculiar cases arises from the morbid state of the patient's mind: she supposes that she cannot walk or move, or bear the shower-bath and other means; and the kind attentions which it would be inhumanity to withhold from such apparent afflictions seem to make them more intractable.

Hysterical palpitation is often almost instantaneously relieved by the valerian, or yields to its more continued use. The danger of repeated bleedings in these cases is extreme, or, at least, the mischief thus induced is incurable. The hysterical diabetes will probably be best treated by opium, blisters, or plasters to the loins, flannel worn next the skin, and other parts of the general treatment: spurious symptoms of calculus in the ureters will yield to anodynes and laxative enemata; and attention to the state of the bowels and surface will best keep off the attacks. The great violence of the pain in these cases sometimes leads the practitioner to use the lancet and other means, which are generally superfluous and often very detrimental to the patient.

In the mutable cases, in which various diseases seem to succeed to each other with rapidity, each new aspect of the malady may require new resources; but the general principles of treatment must be kept steadily in view.

We have not spoken in this article of electricity, galvanism, or electro-galvanism, agents which have occasionally been employed in the cure of hysteria; we fear that their application has hitherto done little more than prove the inveteracy of some forms of the disorder. (See Electricity and Galvanism.)

It may here be observed that hysterical women are very generally disqualified for being good *nurses*. Sometimes the performance of that function may be serviceable to them, but they generally perform it inefficiently; their liability to feel all impressions too keenly, and the violent agitations of feeling and temper which belong to them, operating unfavourably on the secretion of milk, and causing disturbance in the child's bowels, and perhaps in its nervous system.

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* For an extreme example, see Dr. Bright's Reports of Cases, vol. ii.

No part of pathology or practice is more unsatisfactory in its present state, or at the same time more promising of future results, than that which relates to the conditions of the blood. If any cases of hysteria could be clearly traced to peculiar states of that fluid, productive of nervous irritation, the object of our treatment would of course be to effect an alteration in it. The means of doing so would be the regulation of diet, the improvement of the digestion, attention to any function obviously deranged, and a careful general regimen. The effects which have ensued in some recent experiments in which saline substances have been directly injected into the veins, would seem to point to very important results. And if the practitioners residing at watering-places had been less satisfied with general assertions of the universal virtues of the mineral waters of their respective localities, and more observant of the actual operation of these serviceable agents in chronic maladies, reasons might have been found for ascribing some part of the benefit derived from them to their effects on the circulating fluids rather than on the bowels, effects which have long been admitted in the case of the chalybeates, but hardly ever hinted at as regards the saline waters. We should desiderate, however, the perfect establishment of facts indicative of such advantage before we should be disposed to send hysterical, and fanciful, and susceptible patients to places resorted to by so many whose idleness and selfishness are their chief complaints. It is not in places devoted in an especial manner to every weak and luxurious indulgence, and in which the honours of medical science cede too often to a miserable waiting upon the caprices of spoiled adults, that we can expect hysterical females to acquire habits of bodily or of intellectual health.

Preventive treatment. — When a young lady has had an hysterical attack of some severity, much anxiety is commonly felt to prevent a recurrence of it; and this may in the generality of cases be thus early prevented by proper attention to the causes which appeared to bring on the attack, and to any peculiarity in the state of her health which has predisposed to it. Where there has been no severe and marked paroxysm, and yet many of the peculiarities of the hysterical temperament exist, the preventive treatment is too often neglected, whilst in the examples in which it assumes peculiar and embarrassing forms, the nature of the disorder is often misunderstood, or, after very insufficient trials, medical and moral means of relief are abandoned.

A careful education may undoubtedly prevent the increase of a susceptibility observed to be naturally too intense; but, although it would be easy to lay down regulations for the accomplishment of so desirable a purpose, it would manifest a great want of experience in the ways and weaknesses of mankind to expect such regulations to be followed with much perseverance. As regards schools, however, it is but just to acknowledge that of late years much more attention has been paid to allowing hours for relaxation and exercise than formerly. Yet the exercises of ladies' schools are often absurdly enough ordered; the natural amusements of running, leaping, and playing at various active games in the open air being considered ungenteel, and, by a strange inconsistency, the rigid positions of the drill serjeant, the fixed distortion and torture of the feet in stocks, as inculcated by dancing mistresses, the difficult poises and attitudes of a system which is termed calisthenic, and sometimes the exercises of tumblers, the climbing of ropes, and the rubbing of tables, are among the approved means of avoiding at once both deformity and the vulgarity of rude and boisterous health. Meanwhile, the nature of their studies is such as hardly to merit the name of mental cultivation. Ostentatious efforts are made to crowd the elements of many accomplishments into a few years, and if the young lady is not afterwards *finished* by those who profess to instil taste as well as art, and who succeed in effacing all natural and simple tastes and traits of character, she commonly remains unskilled even in accomplishments; whilst the want of all love of literature or acquaintance with science, and consequently of all companionable qualities of a higher kind, diffuses an ennui over society that every one feels without thinking of its source, and by which the whole moveable community is driven about from one place of public resort to another, without useful objects, without attachments, without duties; leading to the habitual neglect of all self-government and the creation of much domestic wretchedness. After the confinement of school, the young female is introduced into fashionable life, and exposed to numerous causes of debilitated health. Returning for a few seasons to London blooming from the coast or the country, she leaves town in June the shadow of herself, often bearing in her countenance not only the marks of dissipation, but of expectations disappointed, wounded pride, and a disposition from which all the attractive frankness of youth has been carefully rooted out. Then, perhaps, ensue the mortifications of celibacy, and the misery of growing old without an active and contented mind. Concerning the evil effects of these and many other circumstances, the physician may feel a thorough conviction, but as the circumstances are not much within his control, it would be useless to dwell upon them in the present article. As causes of disease, and especially of hysterical and other various disorders, none will deny their wide and powerful influence but those who have paid no reflection to the operation of human passions in society. From the circles of nobility these follies flow to the families of the country gentry, and from them to the upper ranks of country towns, whose inferiors of every degree imitate them as well as their daily necessities will permit. The dictates of health, of reason, of happiness, are lost in the love of false greatness and over-refinement which hangs over empires devoted to decay. But against such habits it avails little to protest; the physician cannot obviate them, nor are they "curable by any herbs."

He may, however, often with more success devote some portion of his care to the preservation of a healthy body. If every function is well performed, the nervous system will, it is probable, soon become freed from the morbid susceptibility which disposes the young female on receiving any slight impression to the irregular actions of hysteria. It has so often been found useful in chronic disorders of an obstinate nature to place the patient in new circumstances, and thus to change the whole series of impressions to which she is exposed, that this resource should not be overlooked. With this intention the hours of rising and taking food, the times of exercise and rest, the nature of the mental occupations and of the bodily exercises, should no longer be the same as customary. Change of scene, change of climate, change of manner of clothing, may all form parts of such a plan. So many of these changes are effected at once by a removal to a watering-place, or to the sea, that the advantage of such a change may overbalance all other considerations, and be advised with great propriety.

Nor should it be forgotten that the different parts of what is called an alterative treatment often induce most important changes by slow operations, seemingly effected in the actions or condition of the nervous or vascular systems, or wrought upon less obvious sources of continued malady, existing perhaps in the secretory processes. (See Alteratives.)

By the means now enumerated, numerous, as always happens in diseases little obedient to the healing art, and requiring consequently much discrimination in the practitioner who employs them, there is no doubt that many cases of hysteria may be completely cured, and that almost all cases may be more or less relieved. The constitutional susceptibility in some instances of the disorder is so great that relief is all that can be effected, and the protracted character of the malady often leads to its being too soon withdrawn from the care of the physician. Where this is not the case, we believe the failure of the treatment is generally to be ascribed to a want of patience, an insufficient employment of the various resources which we possess, or a want of conformity and perseverance on the part of the patient herself.

Even a palliative treatment, if nothing more can be immediately promised, should not be disregarded either by the patient or practitioner, it being unquestionably true, as Dr. Whytt has remarked, that "long-continued palliation may sometimes make a cure; for while the palliative remedies lessen the bad effects of this disorder of the nerves, nature, either by herself or with their assistance, at length expels or subdues the morbid cause." The practical wisdom of this observation may be remembered with advantage in the treatment of all chronic disease.

We have dwelt longer on the affections united under the name of hysteria than we should have done if we did not know that it is always a peculiar disadvantage to the practitioner to decide, or to be expected to decide, at once upon a plan of treatment of which the immediate effects are to be observable in each hysterical case. It seemed to us that their proper treatment might be facilitated by considering them with reference to their various origin and complications somewhat more closely than had before been done. The best chance of effecting a perfect cure in any case will depend on the deliberation with which all the circumstances connected with it are considered: the origin, the causes, the duration of the malady, and the present state of the patient, well and duly reflected upon, will usually lead to means of eventual relief, to which hasty and presumptuous prescription can seldom or never attain.

J. Conolly.

ICHTHYOSIS, (*Syn.* Lepra ichthyosis, (*Sauv.*;) Lepidosis ichthyosis (*Young*, *Good*;) (from ἰχθὺς, a fish,) *fishskin*, a cutaneous disease, named from its supposed resemblance to the skin of a fish. In our opinion, Willan and Bateman have erred in classing it in the order Squamæ, as it has a much nearer affinity to the papular than to the scaly eruptions. It is characterized by a harsh, papillary, or horny condition of the skin. In other instances, the papillæ are elongated into horny peduncles bearing a broad irregular top. Whatever be the cause of this morbid growth, it appears to have a close affinity to that state which produces the common wart. These excrescences frequently suffer partial exfoliation, which affords the scaly appearance that probably may have led to the present arrangement of the disease.

Instead of the division of the genus into the two species, ichthyosis *simplex* and ichthyosis *cornea*, it would be more consonant with experience to divide it into, 1. ichthyosis *fortuita*; and, 2. ichthyosis *innata*.

In both species of the disease the eruption sometimes appears on distinct portions of the body, whilst the rest of the skin retains its healthy appearance; sometimes it extends over the whole of the surface, except the hairy scalp; and although it is observed directly above and below the flexures of the joints, yet it seldom appears on or around the joints, or, as Dr. Bateman remarks, on the inner and upper parts of the thighs. It also rarely appears in the axillæ, upon the palms of the hands, or on the soles of the feet.

Species 1. Ichthyosis *fortuita*, (ichthyosis *simplex* of Willan and Bateman) not unfrequently affects only the extremities, and occasionally the face. The more extended form of the disease is common in children who come from India at rather a later period than usual. It rarely makes its appearance for the first time in adults, and appears to commence by a soiled appearance of the cuticle, followed by a thickened, papillary, and discoloured condition of the skin, which seems, to a casual observer, the effect of want of cleanliness. By degrees the hardness and roughness increase, so as to afford to the finger, when passed over the skin, the sensation caused by a rough file, or shagreen. The colour of the patches soon deepens to a dirty, brownish-black hue; and when carefully examined, they are found to be composed of small pedunculated horny excrescences, closely impinging upon one another; or, when the disease is general over the body, of conical horny excrescences, the apexes of which are generally loose and separating, so as to give the appearance of being covered with dirty, coarse meal. In some instances these horny papillæ are crowded in various groups, following the variations of the cuticular lines: in other instances they form decided patches, like incrustations upon the part; and when the peduncles are long, and the clothes press upon the parts, the papillæ overlay one another like scales; but in no case do they naturally assume an imbricated or scaly aspect. The patches are occasionally separated by whitish furrows; in some cases, when they are distinct, they terminate abruptly, in others they are gradually lost in the healthy skin. When the face is the seat of the disease, it is usually confined to the cheeks; but in a case mentioned by Dr. Bateman, (Synopsis, 7th edit. p. 80,) and another, in a young lady, which came under our own care, the patches on the cheeks communicated across the nose, so as to produce the appearance of a pair of large brown spectacles laid upon the face: (Ibidem, nota.) In some instances the mammæ in females have appeared completely encased in this horny covering. If the excrescences be picked off, or if they fall off when submitted to the action of the vapour of hot water, they rapidly grow again; but, in the interim, the skin does not bear any trace of inflammation; it appears in a healthy state until the papillæ re-assume their former horny aspect. In the case of the young lady referred to, the disease, which made its appearance about the age of puberty, was preceded by considerable constitutional disturbance, namely, headach, disordered bowels, cold feet, and flushings of the face; but in general no premonitory symptoms have been observed; nor is the eruption accompanied with itching, tingling, or any uncomfortable feelings. The whole skin, in the more extended form of the disease, is dry, and its perspiratory function apparently impeded; it has been suggested that the urine and the pulmonary exhalations balance the defective perspiration, and maintain the general health of the habit. (*Rayer*, Maladies de la Peau, tom. ii. p. 305.) Biett mentions that in some instances the sound or uncovered parts of the skin perspire more than usual.

Few opportunities of ascertaining the condition of the constitution or that of the skin in this disease, have occurred to us; but the few which have presented themselves have confirmed the view we have given, namely, that it cannot be regarded as a scaly eruption. The chorion is found to be thicker than usual, and the furrows which traverse it are deeper than common; the horny papillæ are readily detached by maceration. But these investigations have shed very little light upon the nature of the disease.

Treatment. — The obstinate nature of this eruption has in many instances resisted every plan of treatment, both local and general. With the exception of the decoction of the root of rumex *obtusifolius*, no internal remedy appears to have at any time produced benefit. The decoction of this dock root, made with an ounce of the sliced root and a quart of water, boiled down to a pint, and taken in doses of a fluidounce and a half twice or three times a day, purges briskly, and clears the skin in ten or twelve days; but in cases of long continuance the eruption is likely to return. Dr. Willan strongly recommended pitch, made into pills with flour or some farinaceous matter; the dose being gradually increased until twenty or thirty of the pills are taken in the course of the day. The pitch seems to operate by stimulating the capillary system, so as not only to enable the skin to throw off the patches of horny cuticle, but to restore the skin to its natural and healthy state.* Arsenic is sometimes useful on the same principle; but the experience of those who have had the best opportunities of seeing and treating the disease, affords little encouragement to prescribe it. The dock-root, the use of which was first recommended by the writer of this article, is certainly the most effectual remedy which has been hitherto employed: the only objection is its disposition to purge, which, however, can be moderated by the addition of ten or twelve drops of laudanum.

In old cases, when the eruption returns, and is successively removed by the decoction of the dock-root, the obstinacy of the case often depends upon a state of the skin which is sometimes only to be permanently relieved by the application of blisters over the whole of the diseased surface: this was the case in the instance of the young lady already mentioned.

With regard to external means, almost every stimulant and detersive plaster and ointment has been tried, and each in its turn declared nugatory. The scales have been picked or shaved off, and removed in various ways, but in the greater number of instances without any permanent advantage. Mr. Plumbe found the firm application of adhesive straps aid greatly the desquamation, if this term may be employed, of the patches; the diseased cuticle was softened, and might be scraped off without pain. "By persevering," says Mr. Plumbe, "in this plan, the skin gradually acquires a healthy texture." (Practical Treatise on Diseases of the Skin, 1st edit. p. 334.) Sulphur fumigating-baths have been found useful, and the benefit received is undoubtedly more permanent than when the common sulphureous baths of Harrowgate, or similar springs, are employed; but, nevertheless, in several instances in which we have seen the fumigating baths used, the eruption has returned after they were discontinued. Whatever applications are used, the daily employment of the warm bath, with friction whilst in the bath, and brisk exercise taken immediately afterwards, materially aids the restoration of the healthy condition of the skin. The bath should be used in the morning.

Species 2. Ichthyosis *innata*.—This congenital form of ichthyosis, although scarcely perceptible at birth, yet even at that period may be recognised by the skin being harsher and thicker than usual in infants, and rough when the finger is passed over it. By degrees, as the infant grows, the disease assumes its proper character. In almost every recorded instance the disease has been hereditary. As in the fortuitous species of the disease, the rigid and scaly state of the skin is sometimes partial, sometimes general, assuming the appearance as if the body was covered with a coat of mail. The case of the native of Suffolk, known by the name of the "Porcupine Man," and described by Mr. Baker in the forty-ninth volume of the Philosophical Transactions, is the nest illustration of this form of the congenital disease. The face, the palms of the hands, and the soles of the feet, were the only parts free from the scaly covering. The disease appeared about two months after birth, and the scales regularly dropped off every winter and re-appeared in the spring. The individual enjoyed excellent health, and had six children, all of whom were covered with the same excrescences. Many other curious examples of congenital ichthyosis are to be found in the Royal Transactions and the memoirs of the various scientific societies throughout Europe; but as no means that have hitherto been tried have proved successful in restoring the healthy texture of the skin, it is unnecessary to refer to them.

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* Dr. Willan generally ordered at first three or four five-grain pills to be taken three times a day; and the number of pills to be gradually increased until a drachm of the pitch was taken for a dose

The ichthyosis *cornea*, horny fish-skin of Willan and Bateman, the *cornua cutanea* of Plenck, (Doctrina de morbis cutaneis,) the *appendices cornés* of Rayer, (Maladies de la Peau, tom. ii. p. 315,) has been improperly confounded with the congenital form of ichthyosis by Bateman and Rayer; but the horny appendages constituting this affection, which cannot be regarded as a species of ichthyosis, are rarely if ever congenital, and differ in every respect from the horny papillæ of ichthyosis. "They are," as Bateman expresses himself, "purely of cuticular growth, consisting of a laminated callous substance, contorted and irregular in form, and not unlike isinglass in appearance and texture." In every instance they are accidental, and generally connected with some diseased growth, such as wart; (*Morgagni*, de Sedibus et Causis Morborum, ep. 65, art. 2. *Avicenna*, canon. iv. fen. 7, tract. iii. cap. iv. *Lorry*, de Morbis Cutaneis, p. 519): or they arise in the cavity of encysted tumours of very slow growth. Their extirpation belongs to the province of surgery; the only effectual remedy being excision and the ample destruction of the surface secreting them, at an early period.

[Under the name *Ichthyosis sebacea*, Mr. E. Wilson (*A Practical and Theoretical Treatise on Diseases of the Skin*, Amer. edit. p. 276, Philad. 1843) describes a morbid condition in quality and quantity of the secretion from the sebaceous follicles of the skin, which spreads upon the surface of the epidermis, forming a thin layer that dries and hardens, and breaks, in the direction of the linear markings of the skin, into small polygonal portions. These concretions increase in thickness by the accumulation of fresh sebaceous secretions, and become discoloured from exposure to dust and dirt. The small masses have the appearance of scales closely adherent to the epidermis, are hard and dense in texture, and present various degrees of thickness.

The best method of treatment is to remove the scaly concretion by means of the warm bath or warm fomentations rendered moderately alkaline by subcarbonate of soda or potassa, several times repeated; after which the sebaceous glands may be excited to healthy action by frequent ablutions with warm or cold water, succeeded by brisk frictions with a rough towel, sea-bathing and astringent lotions or ointments, composed, for example, of sulphate of copper or sulphate of zinc. Mr. Wilson (*Op. cit.*) states, that in one case of the disease he obtained much benefit from the exhibition of milk of sulphur. The bowels must be kept open, and the diet be regulated.]

A. T. THOMSON.

ICTERUS. (See JAUNDICE.)

IDENTITY, PERSONAL.—The question of personal identity becomes not unfrequently a matter of vital importance in both civil and criminal investigations.

1. Thus it may be doubted whether a child claiming an inheritance is the same that he pretends or is pretended to be, as in the celebrated Douglas[*] or Anglesea (for the Anglesea trials see 17 and 18 Howel St. Tri. and Harg. St. Tri.) causes; or long absence of the owner of property may give rise to a similar doubt, as happened in the following instance related by Zacchias. (Quest. Med. Legal. Consilium 61.)

A noble Bolognese, named A. Casali, left his country at an early age and joined the army. He was supposed to have lost his life in the wars; but after an absence of thirty years he returned and claimed his property, which his heirs had already appropriated to themselves. Although there were some marks which appeared to identify him, yet the change in appearance was so great, that none who remembered the youth were willing to allow that this was the individual. He was arrested and imprisoned. The judges were in great doubt, and consulted Zacchias whether the human countenance could be so changed as to render it impossible to recognise the person. His opinion was in the affirmative; in consequence of which, and because the heirs could not prove the death of Casali, the judges restored to him his name and estates. (See also Foderé, vol. i. p. 109.)

Thus it might happen that the true heir would not be able to prove his right merely by failing to establish his identity; while, on the other hand, an impostor may succeed where he has no claim, merely by the force of resemblance. One of the most remarkable instances of such an occurrence is that of Martin Guerre, which came before the parliament of Toulouse in 1560.

Martin Guerre had been away only eight years, when a certain Arnauld Dutille, depending on his likeness to the absent person, formed the design of taking his place, and actually took possession of the property and wife of the true Martin. Children were born of this union, and he lived in the family more than three years, with the four sisters and two brothers-in-law of Martin, without being suspected. At length, however, it became matter of trial, and three hundred witnesses were examined; thirty or forty of whom deposed that the new comer was really Martin Guerre, with whom they had been on habits of the closest intimacy. Nearly an equal number swore that he was Arnauld Dutille; while the others were so perplexed by the resemblance between the parties that they would not venture to affirm whether the individual before them was the one or the other. The judges also were completely puzzled, and were on the point of deciding in favour of Dutille, when the arrival of the true Martin exposed the imposture; though to the last the effrontery and impudence of Dutille led many to doubt, and even Martin himself appeared confounded; so that the judges were still more embarrassed than before his arrival. At last, however, he was fully identified and recognised by his wife and sisters. (From the *Causes Célèbres.*)

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[*] See Journals of the House of Lords, and also Speeches and Arguments, &c. of the Lords of Session of Scotland in the Douglas Trial. London, 1767.

2. Secondly, in criminal prosecutions the question has very frequently arisen, whether a prisoner is actually the person who committed the offence with which he stands charged; or, where a prisoner after conviction escapes and is retaken, whether he is the same person that was convicted. The same question also applies in cases of return from banishment.

In connection with this branch of the subject, circumstances have frequently occurred evincing the vital importance of the accuracy which should furnish grounds of evidence; and the extreme caution by which witnesses or prosecutors should be guided in depositions. A few years since a gentleman coming into Dublin late in the evening, was stopped and robbed by a footpad. A man was arrested by the police under suspicious circumstances, and, being recognised by the gentleman, was committed to abide his trial, when he was identified by the prosecutor in the most positive manner; in consequence of which he was found guilty, but, owing to previous good characte ecommended to mercy. In a very few days afterwards, the gentleman was surprised and horror-struck at meeting on the road the man who had really robbed him.

The mistake here appeared to arise from the imperfect light in which the robbery had taken place, and naturally suggests for our consideration a question which has given rise to some discussion, and appears to require notice here, viz. *the degree of light which may be necessary to enable an observer to distinguish the features, so that the person may be afterwards identified.*

In a case which occurred in France in 1809, of a person shot at night, it was stated that the flash of the pistol enabled the witness to identify the features of the assassin. The possibility of this was referred to the Institute, who reported against it. Foderé, on the other hand, believes that if the persons be at a small distance from each other, and the night very dark, such an event might be by no means impossible.

A case in point occurred in England in 1799. A man named Haines was indicted for maliciously and feloniously shooting at Edwards, Jones, and Dowson, Bow-street officers, on the highway. Edwards deposed that, in consequence of several robberies near Hounslow, he, together with Jones and Dowson, were employed to scour that neighbourhood; and that they accordingly set off in a post-chaise on an evening in November, when they were attacked near Bedfont by two persons on horseback, one of whom stationed himself at the head of the horses, and the other went to the side of the chaise. The night was dark; but he swore that, from the flash of the pistols, he could distinctly see that the man rode a dark-brown horse between thirteen and fourteen hands high, of a very remarkable shape, having a square head and very thick shoulders; and altogether such that he could pick him out of fifty horses: he had afterwards recognised the horse. He also perceived, by the same flash of light, that the man at the chaise-door had on a rough-shag brown great coat.

A lady, a patient of the writer, lately told him that on one occasion, on her passage from India, she awoke in the middle of the night and heard some one stirring in her cabin, but could see nothing, it being quite dark; when suddenly the cabin was so completely illuminated by a flash of lightning, that she could see distinctly a man rummaging one of her trunks, and discerned his features so accurately that she identified him next morning; some of the stolen things were found upon him, and he subsequently acknowledged the fact.

We were once present at a trial when a witness swore that the prisoner at the bar was one of a party who attacked and burnt his house, and that he saw him, at a distance of more than ten yards, in the act of putting a burning coal into the thatch; the night being *so bright* that he could distinctly recognise his features at that distance. This occurred in the middle of December. Subsequently, a gentleman of undoubted veracity swore that he recollected the night of the attack, and that it was *so dark* that he could not see his horse's head as he rode along! On reference to the almanack, it was found that the moon was at the time in her last quarter.

The extraordinary resemblance which is occasionally observed between two individuals furnishes another ground for extreme caution in swearing to the identity of a prisoner not absolutely taken in ipso facto.

At the Old Bailey in 1822, Joseph Redman was indicted for assaulting and robbing Wm. Brown. The prosecutor, on his cross-examination, stated that he knew a man named Greenwood, who, with his hat on, so much resembled the prisoner that he should hardly know one from the other; Greenwood was in custody, and was brought to the bar, when the extreme similarity between the two men struck every one present with astonishment. Redman proved an alibi, and the jury returned a verdict of not guilty.

The case of the Perreaus was a remarkable illustration of this fact. Daniel and Robert Perreau were twin brothers, and in 1775 were tried and executed for a forgery on Mr. Adair. So great was the resemblance between them, that Mr. Watson, a money scrivener, who had drawn eight bonds by order of one or other of the brothers, hesitated to fix upon either; but being pressed to make a positive declaration, he at length fixed upon Daniel. The name of these unfortunate men is familiar to the public from the well-known exclamation of George III., when asked to pardon Dr. Dodd,—"If I *save Dodd,* I shall have *murdered* the Perreaus."

A very remarkable instance of personal resemblance was for some years under our own observation in the sons of a poor peasant. They were twins, and so much alike, that one of them, who was very wild, used frequently to bribe his brother to change clothes with him, and go home to take a beating in his place; the father having no other means of distinguishing them except by their dress.

An individual was indicted and tried at New York in 1804 on a charge of bigamy, and the whole evidence turned on the question of his identity. He was called Thomas Hoag by the public prosecutor, but stated himself to be Joseph Parker. Several witnesses swore that he was Thomas Hoag, among whom was a female that he had married and deserted. It was stated that Hoag had a scar on his forehead, a small mark on his neck, and that his speech was quick and lisping. All these peculiarities were found on the prisoner. Two witnesses deposed that Hoag had a scar under his foot, occasioned by his treading upon a drawing-knife, and that this scar was easy to be seen, and had been seen by them. On examining his feet in open court, *no scar was to be found on either of them;* and it was further proved, that at the time of his alleged courtship of his second wife in Westchester county, he was doing duty as a watchman in the city of New York. The jury acquitted him. (Beck's Medical Jurisprudence, p. 223.)

3. We must not omit to mention the necessity that occasionally occurs for identifying the dead, as in cases of murder, accidental death, exhumed bodies, &c., cases which not unfrequently present themselves under very embarrassing circumstances.

In January 1817, the body of a woman was found tied to a boat near Greenwich Hospital, and an inquest was accordingly held, but adjourned on account of vague evidence. At the second sitting an old man declared the deceased to be his daughter, who had been the wife of an out-pensioner, and between whom and her husband a fight had taken place with sharp instruments in his presence; that soon after both parties left his house, and he had not heard of them since. Other witnesses also supported the statement that it was the body of the old man's daughter. A second adjournment took place. The constables in the mean time had sought in vain for the husband, but *they found the wife alive,* and she was produced accordingly. The coroner reprimanded the witnesses, though the strong likeness between the living and the dead woman was allowed to be sufficient to impose on even better judges. (Smith's Principles of Forensic Medicine, p. 500.)

In swearing to the identity of a dead person, witnesses should be very cautious how they assume any except indelible marks as a means of recognition, because so complete an alteration takes place in the features and general appearance soon after death as to deceive even the nearest relatives. A trial took place some years ago in Edinburgh, which illustrates satisfactorily this part of our subject. A prosecution was instituted against four medical students for exhuming the body of a lady. The body was so disfigured that it could not be identified by the friends; the ovaries were, however, examined, and it was reported that there was found in one of them a perfect corpus luteum, which would be sufficient to prove that the remains were not those of the lady in question, who was a virgin, and advanced in years. On the trial there was a total contradiction between the medical witnesses as to the corpus luteum, but the body was afterwards identified by a dentist who produced a cast of the gums which he had taken before death.

Even under circumstances apparently less difficult, great doubt may exist as to identity. A resurrection man was lately tried before the high court of justiciary in Edinburgh for raising the body of a young woman from the church-yard of Stirling. Nine weeks after death, the body was discovered and identified by all the relations, not only by the features, but by a mark which they believed could not be mistaken, she being lame of the left leg, which was shorter than the right. There was a good deal of curious swearing as to the length of time after death that the body could be recognised, but the jury was convinced that the *libel was proven,* and gave a verdict accordingly. "Now, I am certain," adds the relater (see Beck's Elements of Medical Jurisprudence, p. 223, note, signed *Dunlop,*) of this case, "that this was not the body of the woman who was taken from the church-yard of Stirling, but one that, at least six weeks after the time libelled, was buried in the church-yard of Falkirk, from which she was taken by this man, who also had taken the other, for which he was tried; she also was lame of the left leg: thus, though guilty of the offence laid to his charge, he was found guilty by a mistake of the *corpus delicti.*"

4. From the foregoing cases may be collected a general view of the facts or circumstances likely to engage the attention of a witness, or a court, in cases where the identity of an individual may be doubted or disputed, and of the circumspection necessary in giving testimony on such a subject; in doing which we ought always to keep in view the following considerations, at least.

Seeing the great resemblance that may exist between different persons, we should hardly ever, after a lapse of any considerable time, trust to our mere recollection of external form or peculiarity of features, except we are able to connect these with some indelible or unalterable mark, such as nævi, cicatrices produced by disease or operations, congenital malformations; with reference to which object it would be very desirable that medical men practising midwifery should in all cases note down along with the other circumstances of time of birth, &c., any bodily peculiarity of the infant by which it might afterwards be recognised. We once detected by this means an attempt at substitution of a child, which would otherwise have certainly succeeded.

We should remember and make allowance for the great alteration that may be made in the person and countenance by the mere lapse of time, especially at the season of life when youth is matured into manhood, and by altered habits. When the brethren of Joseph stood before him, "they knew him not." If to time be added the effects of a hot or very cold climate, or disease, the pressure of mental anxiety or bodily hardship, the effects are still more striking:

> Danger, long travel, want or woe
> Soon change the form that best we know;
> For deadly fear can time outgo,
> And blanch at once the hair;
> Hard toil can roughen form and face,
> And want can quench the eye's bright grace,
> Nor does old age a wrinkle trace,
> More deeply than despair.
>
> SCOTT'S MARMION

> [My hair is grey, but not with years,
> Nor grew it white in a single night,
> As men's have grown from sudden fears.
>
> BYRON.

The change in the colour of the hair thus referred to might give occasion to a question of identity. It has likewise become a question, whether it is possible to change the colour of the hair by any physical agency. A case which occurred in Paris in 1832, gave occasion to some careful experiments by Orfila (*Traité de Méd. Lég.* i. 127, 142), and by Devergie (*Médecine Légale*, 2de édit. ii. 536, Paris, 1840,) in order to discover what changes could be induced in the hair by chemical agents: and they have given various methods by which a change from light to dark and conversely may be accomplished. (See, also, Guy, *Principles of Forensic Medicine*, Pt. I, p. 20, Lond. 1843.)]

The return of Ulysses, and his rejection from his own halls, unknown by all, and recognised by his faithful dog alone, although probably no more than a poet's fiction, has been realized in more instances than that of Casali.

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W. F. MONTGOMERY.

[IDIOCY. (See INSANITY.)]

IMPETIGO, *humid or running tetter*,* (from *impeto*, to infest,) is a non-contagious, pustular affection of the skin, terminating in thick lamellated scabs or thin scaly crusts. Willan and Bateman, who are followed by Biett and Rayer, enumerate five species of impetigo; but in our opinion there are only two distinct species, the one unattended by febrile symptoms, the other preceded by them; the first three forms of impetigo may be ranked as varieties. We therefore propose the following arrangement:

Spec. 1. Impetigo *simplex*.
  Var. a. Impetigo *figurata*.
  b. Impetigo *sparsa*.
  c. Impetigo *scabida*.
2. Impetigo *erysipelatodes*.

The first of these species (impetigo *simplex*) appears generally without any obvious premonitory symptoms, attacks chiefly the young, and those of a lymphatic temperament; and displays itself in clusters and groups of psydracious, or irregular, slightly elevated, small pustules, which, after discharging their contents, continue to exude a thin, acrid ichor, accompanied with much itching, or rather stinging, and a sensation of heat. This discharge concretes into thin, yellowish, semidiaphanous scabs, which turn up at the edges, so as to allow the discharge to ooze from under them. The disease is frequently chronic, or kept up by successive eruptions of the groups of pustules. The two first varieties of this species are founded on the manner in which these patches of eruption appear; whether large, circumscribed, oval, or some other regular figure; or small, disseminated, and assuming no peculiar form: the third variety is distinguished by forming one continuous crust over the affected part.

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Impetigo *sparsa* differs from the former variety chiefly in the irregular and scattered distribution of the pustules: these appear in small groups, dispersed without any regular order in the extremities, about the neck and shoulders, and occasionally on the face, the ears, and scalp. They run the same course as those of impetigo *figurata*, but the scabs which succeed the bursting of the pustules are thicker, more friable, and do not form in so large plates as the former variety: the surrounding inflammation is, however, more extensive, and they oftener terminate in ulceration, interspersed with fissures, (See Atlas of Delineations of Cutaneous Eruptions, pl. xv.), and not unfrequently are accompanied with œdema.

Impetigo *scabida* of Willan and Bateman (Practical Synopsis, 7th edit. p. 222) is merely a more severe form of the last variety. It commonly appears on the legs; and the pustules are so numerous, and discharge so abundantly, that the greater part of the limb becomes incased in a yellow crust, variously divided by deep fissures, and not unlike the bark of a tree. When it extends over the joints, the movements of the limb become difficult and painful; and the heat, itching and tingling are greater than in either of the former varieties. When any portion of this crust spontaneously separates, or when it is removed, the vacuity is quickly filled up by the copious discharge poured out from the excoriated surface; the limb generally swells, and if the eruption extend to the toes, the nails drop off, and the new ones are thick, irregular in their form, and notched.

The **causes** of these varieties of the simple impetigo are very obscure. There seems to be a peculiar predisposition to the disease connected with the sanguine or the sanguineo-melancholic temperament, with a thin lax state of cuticle. We have already stated that impetigo figurata is sometimes preceded by gastric derangements, languor, and headach; and this is true of the other varieties; but more generally it cannot be traced to any derangement of the digestive function. In the predisposed, however, it has been observed to follow violent exercise, intemperance, or the use of tainted animal food; and, like some other cutaneous eruptions, it has been traced to mental agitation and to sudden causes of depression, such as disappointment, grief, and fear; (Med. Trans. vol. i. art. 2. Med. Obs. and Inq. vol. i. art. 19. Pract. Synopsis, 7th edit. p. 214, nota); and occasionally to exposure to cold. The first variety in particular seems, also, to be connected with an irritable condition of the system, such as accompanies dentition in infants, and the appearance of the catamenia in women. The third variety does not appear to be influenced by the changes of season, but the first is liable to recur in the spring, and the second in the autumn, often continuing through the winter and disappearing in summer.

Some external irritants acting upon the skin produce pustular tetters closely resembling those of impetigo sparsa; in this way the eruptions termed grocer's and bricklayer's itch are produced; the former arising from the acrid stimulus of raw sugar, the latter from that of lime, acting on the hands and arms of those who are constantly handling these substances. In both cases the disease is readily distinguished from scabies; it is not contagious, and soon disappears when the sources of irritation are removed. Bateman regards the pustular eruption arising from the application of tartar-emetic, and various stimulating plasters to the skin, as displaying some affinity to impetigo; but the pustules are of a very different character, distinct, elevated, and seated on a hard inflamed base, which is never the case in any of the varieties of this eruption.

Diagnosis.—The foregoing varieties of impetigo may be confounded with several other cutaneous affections, but attention to two or three of the most obvious characters common to all the varieties furnishes us with the means of forming a correct diagnosis. Thus the nature of the crusts distinguishes impetigo from eczema, which is, besides, a vesicular disease; and from porrigo larvalis and favosa. Impetigo figurata appearing on the face may be recognised also by the character of the crusts, which are thick, soft, and cellular in porrigo, and do not discharge thin ichor, but thick glutinous pus. The hard inflamed base of the pustules of ecthyma prevents impetigo from being confounded with that eruption; and although, in its advanced stage, impetigo is frequently mistaken for lepra and psoriasis, yet the diagnosis is not obscure, if we discriminate between the scaly exfoliations of the latter and the laminated crusts of the former, or the ichorous discharge of the pustules of impetigo, and the complete absence of all fluid discharge in lepra and psoriasis. Between impetigo and scabies the diagnosis is not more difficult: the distribution of the eruption in patches; the copious discharge of ichor; the rough and fissured cuticle; and the heat and tingling which accompany the itching impetigo, are sufficient guides for recognizing the disease. It is more likely to be mistaken for some of the syphilitic scabby eruptions, especially when these appear on the face. A case of this kind is mentioned as having occurred under M. Biett, in the hospital of Saint Louis, and having been treated for some time as impetigo *figurata*; but the nature of the scabs, which are large, black, thick, very adherent, resting upon a violet-coloured base, and when separated, leaving deep ulcerations, with the regular, circular form of the eruption, are generally sufficient to distinguish this syphilitic eruption from impetigo.

Prognosis.—The only circumstance to be attended to in the prognosis of impetigo is the disposition the eruption always shows to recur: it is more likely to prove obstinate in old people, and in weakened states of the system, than in the young and robust; but under no circumstances can it be regarded as a fatal disease.

Treatment.—The same treatment is applicable to all the varieties of simple impetigo. The internal administration of sulphur, either alone or combined with soda, nitre, and the bi-tartrate of potassa, is strongly recommended by Willan and Bateman in the commencement of the disease; but our experience leads us to agree with MM. Cazenave and Schedel, that the preparations of sulphur have been too indiscriminately employed, and that they have frequently proved hurtful, aggravating the symptoms, and favouring the disposition of the eruption to re-appear. The sedative and cooling influence of conium in the common effervescing mixture, with the aid of emollient fomentations, or even of simple tepid water, constitute the best and most efficient means in the incipient stage of any of the three varieties which have been described. In cases of impetigo *figurata* extending over a considerable portion of the skin, particularly when it attacks the face, M. Biett recommends moderate bloodletting, either local or general; we have never ordered either, and indeed cannot exactly conceive how the abstraction of blood is likely to prove useful. When fever accompanies the eruption, we have found no difficulty in controlling it by antimonials and calomel.

If simple impetigo proves obstinate, an alterative course of mercurials, either hydrargyrum cum cretâ or Plummer's pill, with sarsaparilla or decoction of cinchona bark, is generally supposed to be indispensable; but we have found the occasional administration of five or six grains of calomel at bed-time, followed by a brisk cathartic next morning, and the arsenical solution given in the decoction of elm-bark three times a day, more beneficial. In many habits, indeed, the skin is peculiarly sensitive to the stimulus of mercury, whether internally administered or applied to the surface; in these cases in particular, mercurial alteratives prove hurtful. Every description of local application has at one time or another been employed in impetigo; in some cases even the most soothing and emollient cannot be endured; in others the most stimulant have been applied with advantage. When the discharge is profuse, ointments prepared either with the oxide of zinc, or the white precipitate of mercury, or the sub-acetate of lead, have been found most useful in moderating the quantity of the discharge, and allaying the irritation. In a drier and less irritable state of the eruption, the ointment of the nitrate of mercury diluted with six or seven parts of lard or of simple ointment, or the tar ointment, will be found advantageous in securing a more healthy surface when the crusts separate. We have also seen an ointment formed by triturating two drachms of subnitrate of bismuth with an ounce of simple ointment very serviceable in this condition of the eruption. In the thickly encrusted state of the limbs, in impetigo *scabida*, no local application will prove beneficial until the incrustations are removed, which is best effected by poultices, or by exposing the limb to the vapour of hot water; after the crusts are removed, the surface should be covered with pledgets of lint, thickly covered with any of the mild ointments above mentioned, or touching the whole with a solution of nitrate of silver.

In many instances the irritation is scarcely supportable: in such cases we suggested, some years ago, the use of the hydrocyanic acid, in the proportion of half a fluidrachm to two fluidounces of water, with half a drachm of alcohol, and two or three grains of acetate of lead, as a lotion which not only soothes the irritation, but disposes the skin to regain its healthy action: subsequent experience has sufficiently established the value of this application. It is proper, however, to mention that Mr. Plumbe met with two cases in which its application was followed by considerable intermission of the pulse, which ceased on discontinuing the use of the lotion; but in these cases both legs were affected, and the lotion was consequently most extensively applied, which may in some degree account for the effect it produced. We have never met with any unpleasant result, although we have most extensively employed this form of lotion.

In very obstinate chronic cases of impetigo, the baths of Harrowgate, or the artificial sulphur fumigating baths, generally prove effectual, not only in clearing away the eruption, but likewise in preventing its return. With the same view the waters of Barèges, Enghien, Bonnes, and some other of the continental springs, and also the warm sea-water bath, followed by a course of sea-bathing, have proved highly beneficial. In every stage of the disease, the advantage to be anticipated from any plan of treatment depends much on the discrimination of the practitioner. In cases accompanied with much irritability of surface, the internal means should be of a sedative kind; and local applications, with the exception of tepid water, should be wholly abstained from, until some abatement of the irritability admits of the employment of the hydrocyanic acid lotion. In the opposite condition of the disease, the moderately stimulant ointments, with the internal employment of the arsenical solution, will be found the most effectual mode of treating these forms of this troublesome disease.

[A solution of creasote (f.ʒss. ad aquæ f.℥v.) has been found successful; or an ointment of the same (f.ʒss. ad adipis ℥i.) may be used. (*Medicinisch. Zeitung*, Nov. 30, 1834, cited in the author's *New Remedies*, 4th edit. p. 217, Philad. 1843.)]

Under all circumstances the diet of the patient should be milk and farinaceous matters, with a very moderate proportion of animal food once a day; wine, spirits, and every description of fermented liquor, must be sedulously avoided.

Impetigo *erysipelatodes*, the second species of this eruptive disease, closely resembles, in its commencement, the ordinary appearances of erysipelas, with slight febrile symptoms, which are followed by a puffy swelling of the upper part of the face, accompanied with redness and an œdematous state of the eyelids. The inflamed surface, on close examination and running the finger over it, appears papular, and in a day or two it becomes covered with psydracious pustules, that break and discharge a hot acrid fluid, which irritates and often excoriates the sound surface on which it flows. This state of the eruption, which often covers the greater part of the face, and extends to the neck and chest, is attended with the same heat, itching, and tingling, that accompanies the varieties of simple impetigo; it continues in this condition for some days, the discharge, as it diminishes, concreting and forming thin yellow scabs, in the interstices between which fresh pustules appear, and run the course already described. The disease continues for an uncertain period, sometimes for two or three months, and, in disappearing, it leaves the skin red, shining, and in the dry brittle state which follows the other varieties of impetigo.

This form of impetigo is liable to be confounded with eczema *impetiginodes* in the commencement, even by those acquainted with both diseases; in the advanced stage, however, the pustular form of the eruption sufficiently characterizes it. In some instances of the impetiginous eczema, a few psydracious pustules may be observed intermingled with its vesicles, but the latter greatly prevail.

Treatment.—The febrile symptoms which precede this eruption indicate the necessity of antiphlogistic measures in the commencement. Saline purgatives, with antimonials and nitre, generally alleviate the fever, after which decoction of cinchona bark, acidulated either with muriatic or diluted sulphuric acid, may be administered with advantage. When the after stage of the disease proves particularly troublesome, and runs on for two or three months, a slight alterative course with sarsaparilla generally succeeds in completing the cure; or when it can be obtained, much benefit is derived from sea-bathing, or a course of Harrowgate water. As local applications, nothing farther is required than tepid ablution, and guarding the excoriated surfaces with the ointment of oxide of zinc.

[In some troublesome affections of the skin, especially of the hands, conjoining the characters of impetigo with erysipelatous redness and swelling, and inducing most intense suffering, the textures were speedily restored to a healthy condition by the external use of cod-liver oil—*oleum jecoris aselli*—after all other remedies had been tried in vain. (Dr. M. Hall, *Lond. Med. Gaz.*, Sept. 1832.)]

With respect to a supposed species of impetigo described by Willan and Bateman, under the title impetigo *rodens*, we have never seen the disease, and are rather disposed to regard it as a variety of malignant ulcer, complicated with psydracia.

A. T. Thomson.

IMPOTENCE.—*Impotence* or the incapacity of sexual intercourse, and *sterility* or the inability of procreation without loss of the power of copulation, are subjects which require to be considered, first as physiological questions, involving the consideration of all the causes temporary as well as permanent from which these defects may arise; and secondly, as a medico-legal subject, forming disqualifications for the matrimonial state, or affording pleas in exculpation of alleged rape or affiliation.

Impotence may exist either in the male or female; it is, however, most commonly found in the male, as from the nature and conformation of the genital organs in the female, physical impediments to coition more rarely occur, and she is generally enabled to admit the venereal congress at least in a passive manner. Sterility, on the other hand, is nearly confined to the female, for if the male be capable of accomplishing the act of coition, including of course the ejaculatio seminis, no farther question as to his virility can arise.

The causes of impotence may be divided into three classes: 1. organic; 2. functional; 3. moral.

In the human species, as in all the warm-blooded vertebrated animals, the procreation of the species is effected by a congress of the two sexes, and a variety of organs are provided, upon the integrity of which the due performance of this function mainly depends. The male is destined to furnish a peculiar fecundating secretion, which is to be deposited in the body of the female, and for this purpose he is furnished with glands which prepare this fluid, and also with a conduit by which it is conveyed to its proper destination; while the female, being the recipient, offers a cavity into which this secretion is received, and is, moreover, furnished with an organ where the embryo is originally produced by the specific action of the fluid from the male.

Without attempting to enter into an explanation of the process of generation, which has been rightly designated as "one of those mysteries which the present state of our knowledge does not enable us to explain or even to comprehend," (Bostock's Physiology, vol. 1, p. 72,) it may be admitted as the result of observation and experiment, that a failure in any part of this complicated apparatus is attended by impotence or sterility.

I. Impotence in the Male.—In order to effect procreation he must possess all the organs of generation in a state capable of performing their respective functions, and this leads us to the first class of causes of impotence.

1. **Organic.**—Organic impotence may proceed from different sources; there may be, (*a*) deficiency of some of the organs of generation; (*b*) malformation of these organs; (*c*) diseases of some of them, or of the parts in their immediate neighbourhood, sufficient to impede the procreative function.

(*a*) *Deficiency* of the penis, whether natural or accidental, is an absolute cause of impotence. A congenital deficiency of this organ is very rare, but it has been observed. "J'ai traité et guéri," says Foderé, "d'une incontinence d'urine un jeune soldat plein de courage et de vigeur, qui, avec des testicules bien conformés, n'avait à la place de la verge qu'un bouton, comme un mamelon, par loquel se terminait l'uretre. Il m'assura avoir été toujours ainsi, et que ce bouton se renflait quelquefois en la presence des jeunes personnes du sexe, et qu'il en sortait par le frottement une humeur blanche." (Médecine Légale, tom. 1, p. 364.) Accidental deficiency of the penis is more common. This may arise from amputation or destruction by disease. In a subject lately procured for the purpose of dissection in the College of Surgeons, Dublin, the writer witnessed an instance of complete deficiency of the penis from operation. In this subject, which was a very old man, the amputation had been performed so long identity. It has likewise become a question, whether it is possible to change the colour of the hair by any physical agency. A case which occurred in Paris in 1832, gave occasion to some careful experiments by Orfila (*Traité de Méd. Lég.* i. 127, 142), and by Devergie (*Médecine Légale*, 2de édit. ii. 536, Paris, 1840,) in order to discover what changes could be induced in the hair by chemical agents: and they have given various methods by which a change from light to dark and conversely may be accomplished. (See, also, Guy, *Principles of Forensic Medicine*, Pt. I, p. 20, Lond. 1843.)]

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Impetigo *sparsa* differs from the former variety chiefly in the irregular and scattered distribution of the pustules: these appear in small groups, dispersed without any regular order in the extremities, about the neck and shoulders, and occasionally on the face, the ears, and scalp. They run the same course as those of impetigo *figurata*, but the scabs which succeed the bursting of the pustules are thicker, more friable, and do not form in so large plates as the former variety: the surrounding inflammation is, however, more extensive, and they oftener terminate in ulceration, interspersed with fissures, (See Atlas of Delineations of Cutaneous Eruptions, pl. xv.), and not unfrequently are accompanied with œdema.

Impetigo *scabida* of Willan and Bateman (Practical Synopsis, 7th edit. p. 222) is merely a more severe form of the last variety. It commonly appears on the legs; and the pustules are so numerous, and discharge so abundantly, that the greater part of the limb becomes incased in a yellow crust, variously divided by deep fissures, and not unlike the bark of a tree. When it extends over the joints, the movements of the limb become difficult and painful; and the heat, itching and tingling are greater than in either of the former varieties. When any portion of this crust spontaneously separates, or when it is removed, the vacuity is quickly filled up by the copious discharge poured out from the excoriated surface; the limb generally swells, and if the eruption extend to the toes, the nails drop off, and the new ones are thick, irregular in their form, and notched.

The causes of these varieties of the simple impetigo are very obscure. There seems to be a peculiar predisposition to the disease connected with the sanguine or the sanguineo-melancholic temperament, with a thin lax state of cuticle. We have already stated that impetigo figurata is sometimes preceded by gastric derangements, languor, and headach; and this is true of the other varieties; but more generally it cannot be traced to any derangement of the digestive function. In the predisposed, however, it has been observed to follow violent exercise, intemperance, or the use of tainted animal food; and, like some other cutaneous eruptions, it has been traced to mental agitation and to sudden causes of depression, such as disappointment, grief, and fear; (Med. Trans. vol. i. art. 2. Med. Obs. and Inq. vol. i. art. 19. Pract. Synopsis, 7th edit. p. 214, nota); and occasionally to exposure to cold. The first variety in particular seems, also, to be connected with an irritable condition of the system, such as accompanies dentition in infants, and the appearance of the catamenia in women. The third variety does not appear to be influenced by the changes of season, but the first is liable to recur in the spring, and the second in the autumn, often continuing through the winter and disappearing in summer.

Some external irritants acting upon the skin produce pustular tetters closely resembling those of impetigo sparsa; in this way the eruptions termed grocer's and bricklayer's itch are produced; the former arising from the acrid stimulus of raw sugar, the latter from that of lime, acting on the hands and arms of those who are constantly handling these substances. In both cases the disease is readily distinguished from scabies; it is not contagious, and soon disappears when the sources of irritation are removed. Bateman regards the pustular eruption arising from the application of tartar-emetic, and various stimulating plasters to the skin, as displaying some affinity to impetigo; but the pustules are of a very different character, distinct, elevated, and seated on a hard inflamed base, which is never the case in any of the varieties of this eruption.

Diagnosis.—The foregoing varieties of impetigo may be confounded with several other cutaneous affections, but attention to two or three of the most obvious characters common to all the varieties furnishes us with the means of forming a correct diagnosis. Thus the nature of the crusts distinguishes impetigo from eczema, which is, besides, a vesicular disease; and from porrigo larvalis and favosa. Impetigo figurata appearing on the face may be recognised also by the character of the crusts, which are thick, soft, and cellular in porrigo, and do not discharge thin ichor, but thick glutinous pus. The hard inflamed base of the pustules of ecthyma prevents impetigo from being confounded with that eruption; and although, in its advanced stage, impetigo is frequently mistaken for lepra and psoriasis, yet the diagnosis is not obscure, if we discriminate between the scaly exfoliations of the latter and the laminated crusts of the former, or the ichorous discharge of the pustules of impetigo, and the complete absence of all fluid discharge in lepra and psoriasis. Between impetigo and scabies the diagnosis is not more difficult: the distribution of the eruption in patches; the copious discharge of ichor; the rough and fissured cuticle; and the heat and tingling which accompany the itching impetigo, are sufficient guides for recognizing the disease. It is more likely to be mistaken for some of the syphilitic scabby eruptions, especially when these appear on the face. A case of this kind is mentioned as having occurred under M. Biett, in the hospital of Saint Louis, and having been treated for some time as impetigo *figurata*; but the nature of the scabs, which are large, black, thick, very adherent, resting upon a violet-coloured base, and when separated, leaving deep ulcerations, with the regular, circular form of the eruption, are generally sufficient to distinguish this syphilitic eruption from impetigo.

Prognosis.—The only circumstance to be attended to in the prognosis of impetigo is the disposition the eruption always shows to recur: it is might be of moment to bear in mind, where the rapid succession of children is an evil of magnitude. The writer has elsewhere (*Op. cit.* ii. 368, Philad. 1844) referred to two cases, in which procreation appeared to be prevented by the existence of epispadias opposite the corona glandis.]

A contracted state of the prepuce, by which the emission of the seminal fluid is impeded, may be a cause of impotence, but this is easily removed by operation. A more serious case is that in which the prepuce adheres to the glans, and the orifice of the urethra itself is contracted. The writer has at present under his care a boy, eleven years of age, in whom a malformation of this kind exists. The reflected portion of the prepuce adheres universally to the glans, and is firmly attached to the orifice of the urethra, which opening is so contracted as scarcely to permit the passage of an eye-probe. The urine is, of course, voided in drops. If this case be permitted to go on to puberty without relief, there is strong reason to imagine that impotence would be the result.

Malformation of the excretory ducts of the testicle may also prove a source of impotence. Mr. Hunter (Animal Econ., p. 47, plate 5,) represents a case in which the epididymis, instead of passing to a vas deferens, terminated in a cul-de-sac. A similar conformation sometimes occurs in the vesiculæ seminales, where, instead of entering the urethra, they terminate, after being joined by the vas deferentia, in shut sacs. It is evident that when such a disposition of parts exists on both sides, the semen, although secreted, cannot be ejaculated, and, therefore, the individual is rendered absolutely impotent.

(*c*) *Diseases.*—The diseases of the genital organs which cause impotence, may be divided into those affecting the penis, and those affecting the testicles. Of the former may be enumerated excess or defect of muscular or nervous energy, inducing priapism, or paralysis. Priapism gives rise to a temporary impotence when the erection is so vigorous as to close the urethra in such a manner that the semen cannot pass into it. Defect of energy in the vessels, nerves, or muscles of the genital organs, sometimes prevents the influx of blood to the corpora cavernosa in a quantity sufficient to cause erection, which produces a state of atony approaching to paralysis, constituting the anaphrodisia paralytica of Dr. Cullen. This is a disease not unfrequently met with. Instances of it are given by Chaptal, Gossner, Weicard, quoted by Foderé, (Méd. Lég. tom. i. p. 382,) and also by Mahon, (Ibid. tom. i. p. 58,) in which it was removed by local stimulants.

Strictures in the urethra, when the canal is greatly diminished, may oppose such a barrier to the exit of the semen as to render the individual impotent; but it is extremely difficult to ascertain to what extent a stricture may exist without producing this effect. We know that many persons in whom strictures in this canal are found, do not lose the procreative power, and therefore, unless in extreme cases, where the finest bougies are with difficulty passed, we should be cautious in assuming this as a cause of impotence. The opening of the conjoined ducts of the vesiculæ seminales and vasa deferentia may be closed by scirrhous enlargement of the neck of the bladder, by enlargement of the prostate gland, a scirrhous state of the veru montanum, or by disease of the duct itself. Foderé alludes to the cases of two individuals mentioned in a French Journal, (Journal de Médecine de Paris, Ann. 1680,) who having full powers of copulation could never expel semen. On examination after death, the seminal ducts of one were found filled with matter of stony hardness; and in the other the extremity of these ducts was callous and blocked up. All these causes produce inability for procreation by obstructing the passage of the semen, although this fluid be duly secreted.

But the cause of impotence may lie in the secreting organ itself, the texture of which is so altered by disease as to interrupt the performance of its natural function. Thus scirrhus, cancer, scrofula, when they affect the entire substance of the testicle, produce such an obliteration of its intimate structure that the seminal fluid is no longer formed. The form of disease described by Andral must be considered as belonging to this class: "Un état d'induration grise ou blanche du parenchyme avec disparition des conduits séminifères; le testicule représente alors une masse homogène, dure, ou l'on ne trouve plus aucune trace de son organization primitive." (Anat. pathol. tom. ii. part xi. p. 669.) But in order to constitute complete impotence, it is necessary that both testicles should be implicated, and that the disease pervade the entire organ; for a small portion of the gland remaining uninjured may be still capable of secreting semen in a quantity sufficient for impregnation. "In the first method adopted in the East for making eunuchs, we are informed that the masculine efficiency was destroyed by bruising the testes, (a method of castration still pursued in some places with regard to animals,) and destroying their functionary powers along with their organization. Instances of generating, however, seem to have occurred among eunuchs made in this manner, and are explained on the supposition that part of the testes remaining uninjured was still capable of preparing the necessary secretion, and furnishing it to a certain extent." (Dr. *J. G. Smith*, Forensic Medicine, p. 450.)

Local injury may be followed by atrophy of the testicle, and it is well known that a state of complete inaction, such as is observed in those who have maintained a strict monastic life, is often attended by a similar result. Elephantiasis is said to cause a wasting of the genitals and a loss of all sexual appetite, but this is denied by other authorities. (See ELEPHANTIASIS.) A species of idiopathic atrophy of the testicles is described by Baron Larrey, which affected many of the French troops on their return from Egypt. In these cases the organs became soft to the touch, and gradually diminished in size without any pain. Foderé mentions that he observed in some young deserters condemned to work at the canal of Arles, that the testicles melted away just as if they had never existed. (Méd. Lég. vol. i. p. 369.)

Diseases of the neighbouring parts may also prove a source of impotence by affording obstacles to the venereal congress. These are extraordinary obesity and very large scrotal hernia and hydrocele. Obesity, when extreme, must be considered a disease; of this, Martin, king of Aragon, furnishes a striking example. "He is stated by historians to have been so corpulent that neither mechanical contrivances nor medical treatment could render him any assistance towards the accomplishment of venereal congress." (*Paris and Fonblanque*, Med. Jurispr. vol. i. p. 204.) Large scrotal hernia and hydrocele, by distension of the integuments, cause recession of the penis, and render coition impracticable. Besides, these tumours are considered by Foderé to impede the secretion of semen either by causing too great tension of the spermatic vessels, or by so compressing them that their diameter is obliterated. This effect, however, must be of rare occurrence.

2. **Functional.**—One of the most remarkable changes that take place in the transition from youth to manhood is the development of the sexual organs, and the new train of sensations by which it is accompanied. Puberty is the season of life in which the generative function is called into active operation, and unless impaired by excesses or disease, it usually continues in vigour until the sixty-fifth year. "The genital organs (says M. Virey) offer two states during life, in the young and old, which are the frozen zones of existence; the intermediate state is the torrid zone of life. The infant has nothing to give, the old has lost all." (Ryan's Med. Juris. p. 124.) This doctrine, however, must not be received without limitation; for instances of precocity, as well as of protracted generating power, are not wanting. Dr. Ryan (Loc. cit.) cites some examples of children precociously developed, even before the fourth year; and he alludes to a case of a boy described by M. Virey, who at seven years of age was as fully developed as an adult, and who made the most furious attacks on his female acquaintance, and absolutely deprived one of them of that which she could never regain. Instances of vigorous senectitude are also occasionally met with. Of these the case of the celebrated Thomas Parr is, perhaps, the most striking. He married at the age of one hundred and twenty, and was compelled to do penance for an amour in his hundred and fiftieth year. But looking on these as exceptions to the general rule, it may be said that extreme youth or old age is incompatible with the exercise of the generative function.

There are, moreover, certain states of the body in which, although the genital organs be perfect, impotence may nevertheless exist, in consequence of incapability of erection. This may arise from constitutional frigidity, or what may be termed the apathetic temperament. The offspring of infirm aged persons, of parents too young, or of those worn down by debauchery, often present examples of this condition. The appearance of persons of this temperament is thus described by a French writer: (Dict. des Sciences Méd. art. *Impuissance.*) "The hair is white, fair, and thin, no beard, countenance pale, flesh soft and without hair, voice clear, sharp, and piercing, the eyes sorrowful and dull, the form round, shoulders straight, perspiration acid, testicles small, withered, pendulous, and soft; the spermatic cords small, the scrotum flaccid, the gland of the testicles insensible, no capillary growth on the pubis, a moral apathy, pusillanimity and fear on the least occasion." Impotence arising from this cause is usually incurable.

A more common source of impotence is a particular weakness of the generative organs arising from too early coition, from abuse of venereal pleasures, or from indulgence in the pernicious crime of masturbation. In persons whose organs are debilitated by these causes, erection does not take place, although the mind be highly excited by lascivious ideas. The erector muscles have lost power from over-use, and are to a certain extent paralysed; and if semen escapes, it is clear, serous, without consistence, and consequently deprived of prolific virtue.

Among the causes of general debility capable of producing impotence, have been reckoned defect of nourishment, bad quality of food, and unwholesome regimen. But we would observe that these influences must be exerted to the very extreme before they can produce the effect described, for in this city (Dublin), where misery, poverty, and starvation exist to a degree perhaps unparalleled on the face of the globe, procreation proceeds with extraordinary rapidity; and it has fallen to the writer's lot, through his connection with the Coombe Lying-in Hospital, to witness the birth of numberless infants whose unfortunate parents had not for years partaken of a wholesome meal.

The habitual abuse of spirituous liquors, long watching, excessive evacuations of blood, bile, saliva, or fæces, as they tend materially to depress the powers of the constitution, may prove temporary causes of impotence. To this class Marc (Dict. des Sciences Méd. art. *Impuissance*) adds the sedative action of opium, hyoscyamus, and tobacco. The influence of the narcotic gases, in consequence of the sedative effects they produce on the sensitive system, sometimes gives rise to a temporary impotence. Of this the following case given by Foderé is a good example. "J'ai traité un homme âgé d'environ quarante ans, qui, ayant échappé à un état apoplectique occasioné par la vapour du charbon, reste tellement impuissant pendant six mois, qu'il étoit absolument insensible à toutes les caresses que sa femme, qu'il aimoit jusqù' à la jalousie, mettait en usage pour l'exciter. Il reprit complètement ensuite son état naturel." (Méd. Lég. tom. i. p. 382). Certain substances, as the nymphæa or water-lily, nitre, camphor, colchicum, and indeed most of the diuretics, have been supposed to exert directly sedative effects on the generative organs. That this specific action can cause impotence is probably too much to assert, although some writers have done so; but from the beneficial effects we have obtained from the use of nitre and camphor in cases of over-excitement of the generative apparatus, attended with nocturnal emissions, it would appear that these substances are possessed of properties that tend to moderate the venereal appetite. We have heard of a patient rebelling against the continuance of the use of colchicum, in consequence of its impairing his virility. Dr. Paris takes notice of a peculiar species of impotence arising from debility which deserves notice. "It depends," says he, "upon a want of consent between the immediate and secondary organs of generation; thus the penis acts without the testicles, and becomes erected when there is no semen to be evacuated; while the testicles secrete too quickly, and an evacuation takes place without any erection of the penis." (Med. Jur. vol. i. p. 208.)

We have already alluded to the effects of strict chastity on the testicles. In this state of decay impotence is the final result. There are some diseases which stimulate the generative organs, such as gout, rheumatism, hemorrhoids, calculus in the bladder or kidneys: in the latter disease the constant irritation propagated to the glans penis frequently urges the sufferer to coition even during the most severe pain. But there are others which extinguish venereal desire during their continuance. These are nervous and malignant fevers, which engage the sensorium from their commencement, and are accompanied with general weakness and prostration of excitability; and diseases of the brain and spinal cord, occasioned either by internal or external causes. Hennen (Military Surgery) mentions a case of a soldier who was rendered impotent by a blow on the occiput. With reference to the effect of diseases on the generative function, Foderé mentions a circumstance worth being remembered, which is, that it is possible that certain diseases may produce such an alteration in the constitution, that an impotent man may find himself cured of his impotency on their cessation. He adduces the instance of Avenyoes, who stated he had been without offspring during the whole of his youth, but became a father on recovering from a severe fever. Zacchias states a similar instance. An artisan lived twenty-four years with his wife without having children, when he was attacked by an acute disease, from which he recovered; the fruit of his convalescence was the birth of a son, after which he had many children. It is well known that persons recovering from acute diseases are often extremely salacious. Dr. Dunlop (Beck's Med. Jur. by Dunlop) gives an instance of this on the authority of a friend who visited the hospitals in New York, and who stated that patients recovering after the yellow fever exhibited most furious sexual passion, to the great inconvenience of the nurses and their assistants.

3, **Moral.**—We have already treated of those causes which produce permanent impotence, and of those disturbances of the constitution which during their continuance suspend the generative function: we have now to observe upon those causes which in a sound constitution, with perfect genital organs, are capable of suspending their action, but the cessation of which leaves them free to fulfil their office. These are strong mental emotions, such as too ardent desire, fear of not being loved or of being incapable, shame, timidity, surprise, jealousy, hatred, disgust, in short any thing by which the mind is forcibly arrested. A temporary impotence from this class of causes is by no means a rare occurrence. Of all the causes just mentioned, the fear of incompetence is most frequently productive of impotence. It was a knowledge of this fact that led Hunter to adopt the remarkable mode of treatment which proved so successful in a case of impotence. He prevailed on the person to promise on his honour to pass six nights in bed with a young woman without attempting sexual intercourse, and before the allotted time had expired, the patient's only fear was lest the force of desire should induce him to break his promise. Similar instances have occurred to most medical men, and have been cured by the same means. The facility with which the most vigorous man is rendered impotent by this cause, led to the supposition that supernatural agents were concerned in effecting it, and the natural credulity of mankind soon confirmed the idea. This belief in the powers of enchantment, or, as the French term it, "nouer l'aiguillette," has prevailed in most ages and countries. We have accounts of it in the East, in Egypt, among the Greeks and Romans; and even some of the early fathers of the church, St. Jerome and St. Augustin, are said to have been imbued with it. Like other forms of enchantment, persons were found who made it their business to practise it, and even princes were subject to their dominion. Nero and Amasis were, at the suggestion of their concubines, rendered impotent by incantation. In this process there was always something to arrest the imagination; some drug was administered, some obscure and unintelligible words were pronounced, or written on paper with blood, and tied about the victim's neck; a lock of his hair was tied, with certain mysterious ceremonies, or some equally absurd practice pursued, no matter what, so that the proper impression was made upon the mind, and as long as this continued it had the power of preventing erection by the very fear of failure. The progress of knowledge has done for this species of witchcraft what it has done for others, and it is now confined to the lowest and most ignorant people.

II. Impotence and Sterility in the Female.—It is necessary to distinguish between these two conditions in the female, as it is quite possible for a woman to be impotent and not sterile, and sterile but not impotent; in other words, there may exist a malformation of the genital organs of such a nature as to prevent intercourse, on the removal of which she becomes fruitful; and, on the other hand, she may be perfectly competent to copulation, yet never conceive. The latter is by much the most common, and is believed to occur more frequently in the female than impotence does in the male. Strictly speaking, impotence can only be said to exist in the female when the vagina is incapable of admitting the penis. By this incapacity, however, sterility is not always insured, as it will appear from cases to be presently alluded to, that impregnation has taken place when intromission was impossible. But laying aside these instances, as exceptions, it may be stated generally that an impervious vagina is attended with impotence. Such a condition of the female organs may be the result of various causes existing either in the hard or soft parts. It is rare to find the impediment originating in the former, but Foderé alludes to a malformation of the pelvis, such as considerable depression of the pubis, or exostosis, as capable of opposing the act of generation: we cannot, however, believe that deformity of the pelvis caused by approximation of the pubis and sacrum can offer such a barrier as he supposes; and we are strengthened in our disbelief by the many instances recorded, in which impregnation took place notwithstanding the highest degree of deformity. But an exostosis, when it attains a great magnitude, may very well prove an obstacle to coition. The cause of impotence is more frequently found in the soft parts, and this may be either absence or occlusion of the vagina. Cases in which the vagina was altogether wanting are not numerous, but there are some recorded, and of these one of the most remarkable is detailed in the Causes Célèbres. (Tom. vii. and x., Vingtième cause.) We will not give the case at length, but the leading facts were the following. A young woman in Paris was married in her twenty-fifth year to a young man named La Hure. Six years were passed without consummation of the marriage; and then the woman was examined by a midwife, who declared all the external organs of generation wanting, and their place occupied by a solid body pierced by a small hole. The woman admitted that she had never menstruated; nevertheless she had always enjoyed good health. A surgeon, named Dejours, who saw the case at this time, supposing it one of simple occlusion of the vagina, proposed to divide the barrier, in hopes of reaching and laying open the cavity. He accordingly carried a scalpel to the depth of two fingers' breadth, but instead of reaching a vagina he was still opposed by solid resisting parts. Finding this, he judged that he had nothing to hope for in going further, and that he should run great risk of wounding the bladder or rectum. He therefore endeavoured to keep open the wound he had made by the introduction of tents, and this opening remained during life. Matters continued quiet for eight years more, when the husband, disgusted with his wife, demanded a divorce. The woman died at Lyons ten years afterwards, and on examination it was found that the place of the vagina and uterus was occupied by a hard compact substance, in which no cavity could be traced. Not long ago a case somewhat similar was exhibited to the Society of the Faculty in Paris, in which no uterus or vagina existed, and the perineus was pierced by a small hole, which was the termination of the urethra.

A more common case is that in which the calibre of the vagina is so diminished as to resist the intromission of the penis. Several instances of this malformation are to be found in writers on legal medicine and midwifery, one of which we may mention, as it affords a striking example of the manner in which nature accommodates parts to the offices they are called on to perform. A young girl, married at the age of sixteen, had the vagina so narrow, that a goose-quill could scarcely enter it. A young and vigorous husband had failed in all his attempts, and some of the faculty who were consulted declared copulation impracticable. Nevertheless, after eleven years this woman became pregnant without any increase in the dimensions of the vagina. Her friends of course despaired of the possibility of delivery, but about the fifth month of pregnancy the vagina began to dilate, and at the full time it had acquired a size sufficient to permit the passage of the infant. (Mém. de l'Acad. des Sciences de Paris, 1712.) In the celebrated Joan of Arc, the Maid of Orleans, according to the account of two physicians who were ordered to examine her, the vagina was found so contracted that coition must have been impracticable. Malformation of this kind is frequently removable by appropriate treatment. In a case that occurred to Benevoli, he employed emollient fomentations and tents, and by gradually increasing the size of the latter, succeeded in removing the imperfection.

In those cases in which the uterus is divided longitudinally into two chambers, it sometimes happens that the septum is prolonged into the vagina, even to the vulva. (*Andral.*) In this condition of parts, if the intervening membrane be firm and rigid, it may oppose a barrier to coition. The vagina may be also too short and terminate abruptly in a cul de sac; this disposition of parts may be congenital, but it may be also the result of difficult labour. When congenital, it is usually attended by absence of the uterus.

The inflammation that sometimes follows difficult labours (particularly if instruments have been incautiously used) has been known to cause adhesion of the side of the vagina, and so cut off all communication with the uterus. The writer is acquainted with a very remarkable instance of this accident at present in the Coombe Lying-in Hospital, Dublin. The sufferer is a young healthy woman, in whom there is a fistulous opening between the bladder and the vagina, and just beyond the opening the sides of the vagina adhere firmly. She applied at the hospital in hopes of obtaining some relief from her miserable state, which she said was in consequence of a tedious labour, during which instruments of some sort were employed. It is remarkable in this case, that although the outlet for the menstrual discharge is closed, there is no indication that it is poured out by the uterus, for none of the signs of confined menses are present. We are therefore inclined to suppose that the cavity of the uterus itself has been obliterated by the inflammation, and consequently that an operation would not be attended with success.

The vagina is frequently found closed at its orifice: this may be caused in different ways. It is sometimes produced by neglected inflammation and excoriation of the labia in children, and even in adults; and this has extended in some cases to a complete closure of the canal, so that no passage has remained but a small one at the superior anterior part for the discharge of urine. Dr. Ryan (Manual of Med. Jurisprudence, p. 129) states that he has seen four cases of cohesion of the labia externa at the age of puberty, so complete that only a small probe could be introduced at the superior commissure. Dr. Merriman once met with an instance where the entire opening of the labia was so perfectly closed, in an infant of two years old, that there was not the smallest aperture through which the urine could escape. (On Difficult Parturition, 3d edit. p. 221.) We find in the works of Ambrose Paré, Ruysch, Fabricius Hildanus, Benevoli, and others, examples of complete obstruction of the vagina, either at its orifice or at a greater or less depth, by a membrane of such strength as to resist intromission. Dr. Merriman (Loc. cit., p. 216) relates the case of a young woman whom he was called to attend in her first accouchement, and on proceeding to make an examination he found it impossible to introduce his finger into the vagina, that passage being closed by a membranous expansion about one-tenth of an inch in thickness. This membrane occupied the entire opening of the vagina, with the exception of a small aperture through which a pea could hardly have passed. It was finally ruptured by the child's head, and delivery was safely accomplished. The same author gives another case related by Dr. Tucker, in which the obstruction was even more complete. "The labia pudendi were observed to have the usual situation and appearance; but being expanded, they were discovered to be connected to each other by a strong opaque membrane, nearly a finger's breadth, not distinguishable from their external skin in texture and appearance, which was stretched from the surface of the perineum (of whose outward skin it seemed likewise a continuation or production) over the longitudinal sulcus between the labia, and over the clitoris, quite to the pubis. About the middle of this membrane there was a circular aperture, with a strong ring, just large enough to admit a female catheter one-eighth of an inch in diameter." In this case the membrane was so strong that it resisted the forcible impulse of the child's head during several pains, and was at last divided artificially from the aperture to the frenum labiorum. These and many similar instances on record are the cases to which we referred in speaking of hypospadias, as confirmatory of the doctrine laid down there, viz., that an emissio seminis at the orifice of the vagina is sufficient for impregnation, and they afford instances of what may be considered paradoxical, that is, of women being impotent, yet conceiving. The following case from Foderé is so striking that we cannot omit to mention it. A young man had married a young woman, with whom, although he had frequently made the attempt, he could never consummate the marriage, "à son gré." At the end of three months he demanded a divorce, although she declared herself pregnant. She was now examined by many skilful surgeons, who found a hard callous membrane placed at the mouth of the vagina; this they divided, and the operation succeeded so well that the husband relinquished his claim for divorce. The woman was delivered, in six months after the operation, of a male infant at the full term, and of great vigour. From these cases it is plain that this hypertrophied state of the hymen, although it affords a barrier to copulation, is yet capable of removal by operation, and therefore it cannot be considered as a permanent cause of impotence.

Narrowness of the mouth of the vagina is sometimes accompanied with a communication between that canal and the bladder or rectum. Foderé states two cases of this description, in both of which sterility prevailed. Procidentia of the uterus might be supposed to create impotence, were it not that some very remarkable instances of the contrary are recorded. In the fourth volume of the London Medical and Surgical Journal, may be found a description of two cases of this disease, in both of which impregnation took place, although the natural orifice had been fixed without the vulva for years.

We now come to speak of sterility, or of those cases in which, the vagina being pervious, impregnation does not occur. This may depend upon imperfect development or total absence of the uterus, obliteration of its openings, diseases of this organ, obstruction or disease of the fallopian tubes, and absence or disease of the ovaria. That form of imperfection in the uterus in which one-half of the organ is wanting, and which case is attended with but one ovarium and one fallopian tube, does not entail sterility. Chaussier relates a case of this kind in which seven children were born at the full time. (*Andral.*) But there is a variety sometimes found which must render the woman barren; in which the uterus is so small that it is with difficulty found in the pelvis, and the fallopian tubes appear to terminate in the extremity of the vagina. We have already said that unnatural shortness of the vagina is frequently connected with absence of the uterus. Columbus dissected a woman who had always complained of great pain in coitu, in whom he found the vagina very short, and no uterus at its termination. A similar case occurred to Dupuytren: (Répertoire d'Anat. Pathol. t. v. p. 99): the vagina was only one inch in length, the ovaria and fallopian tubes were well developed, but no uterus existed. Foderé states that this malformation may be discovered during life by the smallness of the breasts, &c.; but in the case mentioned by Dupuytren the breasts were well formed, the external genitals developed, and the whole appearance was feminine. It is plain that sterility must attend this defect.

The different orifices of the uterus may be obliterated, and thus impregnation will be prevented. The opening of the fallopian tubes has been found closed; and this may be owing to a simple continuation of the lining membrane of the uterus over it, or to the existence of a particular membrane blocking up the mouth of these tubes, or to an obliteration of the tube itself, which sometimes extends to the distance of some lines from the uterus. When both tubes are thus circumstanced, no utero-gestation can go forward, for obvious reasons. But the mouth of the uterus itself is occasionally obstructed either by an adventitious membrane stretched across, or by an agglutination of its sides; and when this is the case, sterility is the result.

Besides the closing of the uterine extremity of the fallopian tubes, these canals are sometimes impervious throughout their whole extent; sometimes the obstruction is situated about the middle, and at others the fimbriated extremities alone are blocked up; and this latter is frequently caused by an intimate adherence between them and the ovaria. (*Morgagni. Baillie. Richerand. Andral.*)

The ovaria are sometimes wanting. This deficiency may exist at but one side, a specimen of which is preserved in Dr. Hunter's museum; and Dr. Baillie takes notice of others in which these organs were deficient on both sides. Dr. Denman says he was shown two preparations by Dr. R. Hooper, in which the fallopian tubes terminated bluntly, and without any aperture, fimbriæ, or ovaria. (Denman's Midwifery, 6th edit. p. 42.)

Besides these impediments to impregnation, there are certain diseases of the female genital organs, which, when they exist, are found to cause sterility. Polypus in utero is very generally considered to belong to this class; but although the opinion is generally correct, it is not universally true, for it has happened that conception took place notwithstanding the presence of a very large tumour in the uterus. Of this the late Dr. Beatty (Trans. of the Association of Coll. of

Phys. in Ireland, vol. 4) has described a very remarkable instance, which occurred in Dublin in the year 1820. The patient was a lady twenty-five years old, who, in consequence of the indisposition of her husband, had left his bed in May 1819, to which she did not return until August 1820. In the previous May she first perceived what she termed a "lump in her womb," attended with external swelling and soreness on pressure at the lower part of the abdomen. This swelling was not permanent, but was observed to disappear during the menstrual period. Finding an increase in her unpleasant symptoms, she applied to Dr. Beatty in September, and on the 28th of that month he made an examinatian per vaginam. The os uteri was found dilated to the size of a dollar, and in its opening was a large dense substance with a regular smooth surface. On the 10th of November, while out in her carriage, she had a moderate discharge of blood from the vagina, and upon examination the parts were found as they were a month before. At two o'clock the following morning she miscarried, the embryo was entire, the membranes not being ruptured: the contained fœtus was about three months old—a period corresponding with the time at which the connubial intercourse had been resumed, and at which she had last menstruated; and just three months after she first experienced uterine uneasiness. The tumour was expelled in six days afterwards by pains resembling labour, the uterus was inverted by its descent, but on separation of the slight attachment between it and the tumour it was easily reduced. The weight of the tumour was found to be nearly four pounds. This lady was delivered of a healthy boy on the 10th of February, 1822. This was an instance of pregnancy during the existence of a tumour of considerable magnitude in the uterus; but we believe it to be an exception to what usually takes place.

Inflammation, suppuration, calculous depositions, cancer, cauliflower excrescence, corroding ulcer, the irritable uterus of Dr. Gooch, and any disease in which the texture of the uterus is much engaged, or with which the constitution sympathizes strongly, are so many obstacles to impregnation, as are diseases of the ovaria, in which the natural structure of these organs is obliterated, and both of them engaged. Leucorrhœa, when profuse, is very often also attended by barrenness; but this is by no means a constant effect, as we have known instances in which this disease existed to a great extent without preventing impregnation.

A question has arisen whether menstruation is necessary in order that a woman shall be prolific; and it is generally stated that women who do not menstruate cannot conceive. (*Paris and Fonblanque*, Med. Jur. vol. i. p. 214.) This is true when applied to those who have never menstruated, but is not in cases that have had even a single monthly discharge. Foderé (Méd. Légale vol. i. p. 397, ed. 2me) states that, in the first edition of his work, he had maintained that females who do not menstruate are sterile; but he afterwards was obliged to change his opinion, from having observed some patients under his own care enjoying good health without this evacuation, and bearing many children. One of them was a woman thirty-five years old, the mother of five children, the last of which she was suckling. She was in good robust health, and had never menstruated but once at the age of seventeen years. It would appear that a single occurrence of this periodical evacuation is a sufficient indication of generative power; and although irregularity in subsequent years is frequently attended by sterility, it is not to be taken as an absolute cause of it. There is a form of dysmenorrhœa described by Dr. Denman (Denman's Midwifery, 6th edit. p. 90), and Dr. Dewees (Dewees' Midwifery, p. 154) of Philadelphia, which both these authors state to be productive of barrenness. The striking peculiarity in this disease is the formation of an adventitious membrane in the uterus, which is expelled after severe and protracted suffering at each menstrual period. This membrane is sometimes thrown off in pieces, and at others entire, at which time it bears the strongest resemblance to the decidua, so much so that, when it occurs in unmarried females, it may and sometimes does give rise to most painful suspicions. There is a preparation in the museum of the College of Surgeons, Dublin, of an entire membrane of this kind, which might deceive the most experienced eye. Morgagni relates a very remarkable instance in which pregnancy occurred during the existence of the habit just described, but it is probable that there was a suspension of the disease for a time in that case, when the capability of conceiving might exist.

It is well known that instances have happened in which persons have lived for years in unfruitful matrimony, and being after divorce remarried, have both had children. This is a fact which in the present state of our knowledge we are not able satisfactorily to explain, and we will not delay the reader by offering any speculative opinion upon it.

Treatment. — The treatment of impotence and sterility must be influenced by the causes from which they spring, some of which are incurable, whilst others may be removed by appropriate remedies. Those cases which depend upon congenital deficiency of the penis, testicles, vagina, uterus, Fallopian tubes, or ovaria, belong to the former; but we have seen that some of those arising from malformation and disease of these parts are susceptible of cure. Such are phymosis, adhesion of the prepuce to the glands with diminution of the orifice of the urethra, priapism, partial paralysis, strictures in the urethra, diseases of the neighbouring parts, contracted vagina, occlusion of the mouth of this canal by adhesion of the labia, or by a dense hymen, prolapsus and procidentia uteri, polypus in utero, leucorrhœa, dysmenorrhœa: all these are more or less capable of removal either by operation or general treatment. The cases of impotence which depend upon functional or moral causes are much more numerous than those just mentioned, and frequently become the subjects of medical treatment. If old age be the cause, there is little to be done; medicines are useless, and temporary stimulants are often worse. There have been instances of old debauchees, who, wishing to make a last attempt, have taken some of the nostrums, such as the Venetian pastilles, Italian lozenges, &c. and have perished without success in the very effort. Cases arising from debility of the generative organs, from too early coition or the abuse of venereal pleasures, are not unfrequently met with, and indeed furnish the great mass of dupes to quackery. In the treatment of such cases there are many points that must be strictly attended to. We must be careful to remove from the imagination, or regimen, all that may excite the generative apparatus, while we endeavour to strengthen the system by mild nourishing diet and gentle tonics. We must combat on the one hand muscular weakness, and on the other nervous susceptibility, and so restore the equilibrium between the two systems. The local application of cold water has a great effect in allaying the excitable state of the generative organs, and should be had recourse to at least twice a day. If the impotence be owing to moral or physical irritation, the constitution must be lowered by spare diet, cooling acidulated drinks, exercise in the open air, and removal from all objects which excite venereal desires. This plan of treatment we think preferable to the employment of narcotics, which sometimes produce unpleasant effects, and are always hurtful to the digestive organs. In those cases which are purely the effect of atony of the generative organs, and do not arise from their over-excitement, a different line of conduct must be pursued. The diet should be full and generous, with a liberal allowance of spices and wine; and the exclusion of all objects of a nature to excite the senses need not here be recommended. Frictions to the loins, and the cold bath, will be found useful; sometimes it will be necessary to substitute the warm bath when the cold does not produce the healthy reaction we desire. (See Bathing.) If these means fail, we may then have recourse to stimulating applications to the loins, thighs, and pubis, and electricity may be used with advantage. (See Electricity.) In the year 1776, Dr. Graham opened an establishment in London, in which were a number of electrical beds, destined to awaken the dormant generative powers in cases such as we have described.

Modern systematic writers have discarded that class of medicines formerly grouped together under the name of aphrodisiacs, from their supposed power of exciting a desire for venery: it consisted of stomachics, aromatics, odoriferous gums, balsams, resins, essential and volatile oils, perfumes, particularly musk, phosphorus, opium and aromatics combined, and cantharides. These, with the exception perhaps of cantharides, seem to act only as general stimulants, and do not possess any specific powers over the organs of generation. Cantharides, as is well known, when administered in large doses, are sometimes capable of inducing a violent state of irritation of the urinary and genital organs, indicated by strangury, bloody urine, priapism, &c.; but this condition can never be induced without other violent constitutional symptoms being also brought on, to the great hazard of life, (Christison on Poisons, p. 456); and we are much inclined to doubt that a person labouring under these effects is disposed to venereal enjoyments. However, cantharides have been employed as an aphrodisiac, and for this purpose they entered into the composition of many secret remedies, such as the Venetian pastilles, Italian lozenges, love potions of Italy and Turkey, &c. to the use of which we believe many have fallen victims. The "remède de magnanimité" of Kœmpfer, so called after its inventor, is composed of opium, musk, and ambergris, and is extensively employed in the East, where it is taken daily by the great for the purpose of exciting venereal desires.

From what has been said in commenting upon the different causes of impotence, it is unnecessary to prolong this article by any further notice of their medico-legal application; we will therefore conclude by deducing, in the words of Dr. Ryan from the preceding statements, the following general principles:—

"1. To declare either sex impotent, it is necessary that certain physical causes be permanent malformations or accidental lesions, and be evident to our senses, which art cannot remedy, and which prevent the faculty of exercising a fecundating coition.

"These causes, when rigorously examined, are few in number.

"The moral causes of impotence ought not to be taken into consideration, as they would serve for an excuse for an individual accused of impotence." (Ryan's Med. Jur. p. 133.)

Thomas Edward Beatty.

INCUBUS, (from *incubo*, to lie or sit upon,) *nightmare:* an affection coming on during sleep, and characterized especially by a sense of weight on the chest, with an inability to move, and sometimes even to speak. Various affections attacking a person during sleep produce sensations, often very uneasy, but insufficient to awake him completely; and although his eyes may be open, and he may be conscious of surrounding objects, he labours under the fancies of some horrible dream excited by the sensations in question. It is this state of imperfect possession of the faculties, and the absence of volition, which gives the peculiar character of the disease called incubus, or nightmare; and this circumstance would entitle it to be considered as much a mental as a bodily disorder. The causes of the sensations are, however, physical, and it is against these principally that treatment can be directed.

The usual and severe form is that in which the patient, in the midst of his sleep, generally in the first part of the night, becomes conscious of the sensation of a huge weight on his breast, which oppresses and impedes his breathing. This is accompanied by a feeling of inability to move, and often to speak, which greatly increases the discomfort; and the fancy, ever active, embodies these phenomena into some monster, overpowering and crushing the body. Hence the superstitious names, *nightmare, incubus, succubus, ephialtes,* &c. In many instances the feeling of weight or pressure is less defined; but there is a sense of general restraint and uneasiness which the mind converts into some imaginary danger, such as falling down a precipice, being pursued by an armed enemy or savage beasts, and the like, with a feeling of weight on the limbs, and an inability to escape; and this becoming so intense as to break the remaining tie of sleep, the person awakes with a start, and under the temporary alarm of this imaginary evil.

Nightmare in all its varieties is, then, a disorder of the function of sleep, (if by such a name we may designate a suspension of other functions,) and it becomes an interesting matter of further inquiry, inasmuch as it in a degree presents an analysis of the state of sleep itself. The power of volition, both in mind and body, is that which is the most completely suspended in natural sleep. Sometimes the other mental faculties are equally so, but more generally there are trains of thought going on; and simple sensation, although blunted, is never entirely suspended. Dr. Alison has well established the opinion formerly entertained by Whytt, that respiration is an instinctive motion excited by the sensation of black blood in the lungs; and the movements and changes of posture unconsciously effected during sleep, seem to be of the same kind, and scarcely coming under the head of voluntary motions. When sleep is coming on, there is, first, an indisposition to perform voluntary acts, and if no awakening cause be applied, this soon amounts to inability. But the senses may still be awake, and although volition cannot shape or direct them, trains of ideas result from their impressions. When sleep becomes more perfect, however, the senses become more obtuse, and, unless excited by some considerable impression, incapable of influencing the other mental powers that may remain still in activity. Such an impression, when produced, if of the painful kind, and insufficient directly to awake the person, will not fail to excite some or other of the varieties of nightmare. The form which it assumes will depend on the nature of the bodily impression, and it will be sufficient to illustrate the subject by one or two examples.

In the case to which the term *incubus* or *nightmare* is commonly applied, that, namely, of a sense of weight and oppression on the chest, there is, we believe, an imperfect performance of the function of respiration, caused either by a constrained posture or distended stomach; or in some cases it may be by a slight attack of asthma, excited by acid or other crudities in the alimentary canal. Now such slight impediments during our waking hours are easily obviated by the supplementary aid which voluntary efforts can give to the respiratory process: we change our posture, draw our breath more deeply, relieve the stomach by eructation, &c.; and all this with scarcely a consciousness of the ailment, or of the act which relieves it. But during sleep these movements are not at our command; the respiratory act is more limited, and although sufficient for the natural state of the function, becomes inadequate when an embarrassment renders necessary an increased exertion or new movement. In event of this, therefore, black blood gradually accumulates in the lungs, with its consequent effects of congestion in the right cavities of the heart, and feeling of oppression and suffocation, which, after tormenting the mind for a time in some demoniacal form, at length reaches such an acme, as to break the spell of sleep, and awake the sufferer to the possession of those voluntary powers, by the exercise of which the bodily function is restored to its natural state. No sooner is he fully awake than the bodily uneasiness is removed, and he is sensible only of the mental disquietude which his frightful dream has occasioned; and this, joined with the excitement of the restored circulation, may prevent him from readily composing himself to rest again. This we conceive to be a sufficient explanation of the phenomenon of nightmare; without resorting to hypothetical notions of pressure on the solar plexus or nerves of the stomach, which, if capable of producing an effect at all, should do so equally beyond the period of sleep. Incubus may, therefore, be justly placed in contrast with somnambulism, in which the power of voluntary motion continues, whilst the external senses are either suspended, or their impressions superseded by some internal train of ideas that engrosses the mind.

As causes of incubus, we have already named disordered digestion and constrained posture; and we may now add diseases of the heart, and whatever is capable of interrupting, during sleep, the due arterialization of the blood.

We pass on to notice some other causes which may produce effects of analogous character. Such are, pains of any kind, as tooth-ach, ear-ach, &c., which, when insufficient to prevent sleep, often become the demon of a dream, tormenting the sufferer in a thousand different shapes. Cold feet are another common cause of disordered sleep. There is, however, between these causes and that which produces nightmare, this difference; that in the case of these, the person awakes to a consciousness of the real cause, whereas the sensation of nightmare ceases with the return of voluntary movement.

Various impressions on the sense of touch may engender disturbances of somewhat similar character. On this subject some remarks by the most celebrated writer of our day are too philosophical to be omitted here. "There is one circumstance in which the sense of touch is very apt to betray its possessor into inaccuracy, in respect to the circumstances which it impresses on its owner. The case occurs during sleep, when the dreamer touches with his hand some other part of his own person. He is clearly, in this case, both the actor and the patient, both the proprietor of the member touching, and of that which is touched; while, to increase the complication, the hand is both toucher of the limb on which it rests, and receives an impression of touch from it; and the same is the case with the limb, which at one and the same time receives an impression from the hand, and conveys to the mind a report respecting the size, substance, and the like, of the member touching. Now, as during sleep the patient is unconscious that both limbs are his own identical property, his mind is apt to be much disturbed by the complication of sensations arising from two parts of his person being at once acted upon, and from their reciprocal re-action; and false impressions are thus received, which, accurately inquired into, would afford a clue to many puzzling phenomena in the theory of dreams. This peculiarity of the organ of touch, as also that it is confined to no particular organ, but is diffused over the whole person of the man, is noticed by Lucretius:—

> 'Ut si forte manu quam vis jam corporis ipse
> 'Tute tibi partem ferias, æque experiare'

A remarkable instance of such an illusion was told me by a late nobleman. He had fallen asleep, with some uneasy feelings arising from indigestion. They operated in their usual course of visionary terrors. At length they were all summed up in the apprehension that the phantom of a dead man held the sleeper by the wrist and endeavoured to drag him out of bed. He awaked in horror, and still felt the cold dead grasp of a corpse's hand on his right wrist. It was a minute before he discovered that his own left hand was in a state of numbness, and with it he had accidentally encircled his right arm." (Sir Walter Scott's Letters on Demonology, p. 43.)

Another case, which Dr. Abercrombie in his interesting work "On the Intellectual Powers," cites from the late Dr. Gregory, is clearly one of the same character with nightmare, and well illustrates our explanation of its pathology. "Dr. Gregory mentions a gentleman, who, after sleeping in a damp place, was for a long time liable to a feeling of suffocation whenever he slept in a lying posture; and this was accompanied by a dream of a skeleton which grasped him violently by the throat. He could sleep in a sitting posture without any uneasy feeling; and after trying various expedients, he at last had a sentinel placed beside him, with orders to awake him whenever he sank down. On one occasion, he was attacked by the skeleton, and a severe and long struggle ensued before he awoke. On finding fault with his attendant for allowing him to lie so long in such a state of suffering, he was assured that he had not lain an instant, but had been awakened the moment he began to sink. The gentleman after a considerable time recovered from the affection." (Page 274.) In this case, we have little doubt that there was a real constriction or spasm in the glottis, or some of the air-passages, which became sensible only in the confined posture of recumbency, and during the low respiration of sleep.

We have little to say of the treatment of nightmare, as it must depend on the correction of its several causes. Of these, too much or undigested food is among the most common; hence the propriety of prolonging the period between the principal meal and the hour of rest, as well as of avoiding crude and indigestible articles of food. (See INDIGESTION.) The symptoms of acidity and flatulence are to be treated in the usual way, by magnesia or alkalies, and essential oils or other carminatives; and when these fail, ether will often succeed in relieving the stomach of wind, and the nervous palpitation which often follows an attack of nightmare. Nor is it unimportant to pursue measures to prevent the recurrence of this disorder; for besides that it

> "—— makes sleep a pain,
> And turns its balm to wormwood,"

the disorder that it occasions in the circulation may, in those predisposed, bring on a fit of epilepsy or apoplexy, which not unfrequently occurs during the first sleep.

C. J. B. WILLIAMS.

INDIGESTION.—This word is synonymous with *dyspepsia*, (from δυσπεπτέω, *to digest with difficulty*: Th. δὺς and πέπτω;) and signifies interrupted, laborious, or painful digestion; or, in other words, any derangement of that function by which the aliment, after having been received into the stomach, is converted into chyle.

The function of digestion is in its nature complex, consisting of the harmonious action of an apparatus of several organs, all mutually dependent upon the action of each other. These organs, singly, are liable to be disturbed by many different causes, which may each be again modified in their operation by a multitude of secondary and adventitious circumstances; and as every separate organ must perform its part healthily to complete the general function, so also the disorders of each individual organ may induce various derangements in the action of the whole apparatus. This view of the matter may give us some notion of the necessary diversity of the disorders of the function of digestion, and may serve to show us that, whatever common denomination we may employ to denote its general derangement, we must comprehend different disorders, having their seat in different organs, depending on different morbid conditions, presenting various forms, induced by various causes, and all necessarily demanding various corresponding methods of cure. For though the disorder of one of the subordinate processes may induce the interruption or the disorder of the whole function, and thus may seem to lead only to the same common disease, yet even under this supposition it is not immaterial to ascertain where and in what manner the faulty series has commenced, whether the impediment may have arisen in the stomach, the duodenum, the liver, or in any other organ; but it is also necessary to be acquainted with the particular modification of the function of either of these organs, for in this consists the nature or proximate cause of the disease: just as in the derangement of a watch, though the motion of the entire mechanism may be arrested by the disorder of some of its parts, the artist finds it necessary to discover in which the error lies, whether in the spring, the verge, or the balance, and whether the fault consists in excess or in deficiency of momentum or of matter.

That which physiology leads us to anticipate, observation fully confirms; for pursuing a contrary course of investigation, tracing effects up to their causes, we shall have still greater reason for admitting the diversity of the disorders of the function of digestion. Thus it would be contrary to all the common principles universally admitted in reasoning concerning natural phenomena, to suppose that the most opposite symptoms could arise from the same pathological state of the digestive organs,—that causes the most contrary could induce the same morbid condition, and that methods of treatment in direct opposition to each other could generally overcome one and the same disordered state. Thus,—that an impaired and fastidious, and a keen, craving, insatiable, nay, bulimious appetite; that an unquenchable thirst and a complete disrelish for liquids; that painful sensations of the stomach excited by the presence of food, and others relieved by the presence of food; that pain before eating and pain after eating; that an exalted sensibility of the organs rendering the patient painfully conscious of the whole process of digestion, and a diminished sensibility of the stomach by which a patient, though suffering from, is altogether unaware of, any disorder of the digestive function; that the more easy digestion of solid food by some, and of liquids by others; the agreement of fat or oily substances with some, of albuminous with others; of saccharine matter with one, acidulous with another; that a deranged state of this function, constantly accompanied with a moist, pale, white, or coated tongue, or with a clean, dry, red, appearance of the tongue; with a clammy, moist, perspiring, or dry, shrivelled, impervious skin; with unhealthy, fetid, alvine discharges, or with evacuations which betray no sign of disorder; with a perfectly healthy state of the urine, and a highly unnatural state of that secretion; not to mention secondary and sympathetic affections, various, contrary, and incompatible with each other;—that all these discordant symptoms should emanate from one and the same morbid condition of the digestive organs, is a supposition altogether incomprehensible, and totally at variance with the acknowledged laws of order, constancy, and consistency, which regulate natural events.

In the same manner,—that fasts and surfeits; that repletion and starvation; that taking food too frequently and fasting too long; that the richest viands, the most refined preparations of food, and cold, crude, vegetable fare, without seasoning or condiment; that the varied repast of the most pampered, with every thing to whet and every thing to sate the appetite, and the simple scanty food, greedily devoured for very existence, (whether the potatoe of the poor Irish, the oaten cake of the Scot, or the salted and smoked fish of the Swedish peasant — all three well known to be equally great sufferers from dyspepsia); that wine-drinking and water-drinking; that dry diet and fluid diet; that excessive indulgence in sleep and overwatching; that inactivity of body and excessive fatigue; that indolence of mind and intense bent of thought; that the ennui of the fashionable idler, or the wearisomeness of the artisan; that the anxious cares of business, and the languor of inertion; that dwelling in dry, warm, badly ventilated apartments, and constant exposure to cold moist air; that the too frequent use of the warm bath, and the habitually squalid unwashed skin: —that all these ordinary causes of dyspepsia, so much at variance with each other in their nature and effects, should yet conspire in producing only one disease,—only one pathological condition of the digestive organs,—involves the absurd conclusion, that in the actions of the human body the most opposite causes have, in similar circumstances, the same identical effects.

And no less from the different nature of the means by which the disordered conditions may be corrected or removed, than from those by which they may be induced, shall we have reason to affirm that the derangements of the function of digestion are many and various: or we must suppose that a dry and a fluid diet; that a full diet and a scanty; that one of animal food and one of farinaceous; that a stimulating diet and a cooling; that distilled or fermented liquors and water; that alkalies and acids; that bitters and sweets; that tonics and demulcents; that stimulants and refrigerants; that repletion and depletion; that sipping brandy and sipping ices; that heat and cold; that the warm-bath and the cold-bath;—that means so dissimilar and methods so repugnant to each other, have yet the same operation upon the living body.

From this diversity of symptoms, of causes, and of means of cure, it is more reasonable to infer a corresponding diversity in the morbid condition of the digestive organs, than to embrace the absurdity,—belied by all experience, and only consistent with our superficial learning in the language and grammar of the Book of Nature,—that the same things can have contrary signs, or that in similar circumstances opposite causes can produce the same effects.

It may seem that on this point,—the different nature of the disorders of the function of digestion, we have insisted too much; and indeed we should have thought it unnecessary to have pressed upon the attention of the profession a matter of such obvious importance, had we not occasion daily to observe the general tendency to apply to all these disorders the same method of treatment, as if they invariably constituted merely one and the same disease. The late Dr. Cullen, by affixing a general term to these disorders, may be justly charged with having in no inconsiderable degree promoted this error; but we are likewise not aware that any writer has felt more forcibly than himself its practical inconvenience. "We have established," says he, "a genus of disease under the title of Dyspepsia, and perhaps there was no avoiding it, but it is too general, and under this generality of little use. It comprehends every irregularity in the functions of the stomach; but these are certainly of great diversity in their nature and causes, and we want more accuracy and precision than we yet have." (First Lines, &c. Thomson's Edition.) In this circumstance of the great diversity of diseases comprehended under one common name, has originated the chief impediment to the successful medical treatment of dyspepsia; for it is self-evident that, as its different forms require to be met by corresponding methods of cure, the skill of the physician must mainly depend upon the power of distinguishing them, so as to be enabled to apply to each particular form of disorder its especial remedy, and also to adapt as nearly as possible the modification of the treatment to the modification of the disorder. The perfection of medical skill is most unquestionably the talent of applying to each individual case its precise, and, as it were, its individual cure,—an object which, though difficult of attainment, ought nevertheless to be the constant aim of the physician—the object which he ought unceasingly to pursue, and never rest until he has overtaken. Furthermore, we are very much inclined to suspect that a great part of the real secret of specific remedies lies in this, that they, being only applicable to diseases of one form and few specialties, are on this account alone so constant in their effects. In some degree in confirmation of this opinion, we may observe that when any specific disease, by complication or otherwise, assumes any remarkable deviation of character, then the specific remedy becomes dispossessed of its power. So that the success of these remedies does not so much depend upon any exclusively specific relation between the nature of the medicine and the nature of the disease, (for we know that syphilis is to be cured by other medicines than by mercury; that psora is curable by hellebore as well as by sulphur; that agues may be arrested by arsenic as well as by quinine,) but upon the medicine having the power of curing a disease which is comparatively constant in its character, its operation not being liable to be frustrated by any peculiar modifying circumstances;—the disease thus specifying the remedy, not the remedy the disease.

This view of the matter should afford us reason to hope, that if in diseases less constant in their character and more variable in their accidents, we could meet the specialty of disease by its corresponding specialty of cure, we might also hope for an equal success, of which we have already some example and foretaste in the method of treating some diseases; as, for instance, in the plan of cure followed so successfully by the Pères de la Charité in colica pictonum. It should also teach us that, instead of ransacking every kingdom of nature for specific remedies,—a pursuit literally preposterous,—it is more reasonable, and would most certainly turn to better account, to seek for specific diseases, or by a proper specification, which is the very spirit and essence of practice, to endeavour to make them such. This is the object we have chiefly in view in the following article,—rather a sketch than a treatise of dyspepsia,—namely, to decompose the false and artificial genus comprehended under this term, to endeavour to establish a natural one in its stead, and by a proper classification of causes, symptoms, and methods of cure, to distinguish and define the different kinds of the disorders of the function of digestion,—eorum tempora et causes in quibus medicinæ summa est, (*Celsus*),—so as to be able to establish a more close and accurate relation between each variety of disorder and its most appropriate remedy, in order that more certainty and more success may attend its application. "Ideoque dubitandum non est, quin si medici, missis paulisper istis generalibus, naturæ obviam ire vellent, compotes ejus fierent de quo ait poeta:

> "'Et quoniam variant morbi, variabimus artes;
> Mille mali species, mille salutis erunt.'"
> (Bacon, De Augmentis Scientiarum.)

On reviewing the labours of our predecessors, we are confirmed in these opinions, for we find that the best observers have recognised great diversity in the disorders of the function of digestion, and that though, masking them each with his own particular theory, they have disguised them under particular names, there remains a remarkable coincidence in their observations and in their principles of distinguishing them. Thus we find that Hippocrates (Aphor. sect. iv. Aph. 17–20) made a distinction between gastric and intestinal dyspepsia, to which corresponded the *passio stomachica et ventriculosa* of the Methodists. (*Cælius Aurel.*) This distinction was revived by Hoffmann (De Duodeni morbis) and others, was insisted upon by Pinel, (Nosographie Philosoph.) and indicated by Ferriar (Med. Hist.), and Warren (Med. Transac. vol. iv.) but was never accurately and precisely laid down before the able and useful lecture of Dr. G. D. Yeats upon the diseases of the duodenum. (Id. vol. vi.) Thus Celsus establishes several different disorders of the function of digestion, founded chiefly upon the different morbid conditions of the organs, to each disorder assigning its appropriate remedies.* In the different disorders of the digestive organs noticed by Celsus, not, however, to be all admitted as species really distinct, might no doubt be found most of those recognised by more modern writers; the simple dyspepsia of the solidists, the chylopoietic disorder of Mr. Abernethy, and the chronic gastritis of Broussais. In the disorders of the function of the stomach the Methodists acknowledged two principal divisions, *stomachica passio solutionis et stricturæ*, (*Cælius Aurelianus*) which were again by many of the sect variously subdivided. The former we shall find equivalent to the simple dyspepsia of the moderns, but in the latter may be found a strong resemblance to the dyspepsia from morbid sensibility and irritability of the stomach noticed by Cheyne, (English Malady); Whytt, (Nervous Diseases); and Pemberton, (Diseases of the Abdominal Viscera, &c.); but more insisted upon of late years by Barras (Traité sur les Gastralgies, &c.) and Dr. James Johnson. (On the Morbid Sensibility of the Stomach, &c.) Others, building upon shifting quicksands, founded the distinction of the different kinds of dyspepsia upon their symptoms; and thus Galen, who defined dyspepsia to be any deprivation of the alimentary mass in the stomach by which it was changed into something different from its natural product, distinguished dyspepsia into two species, nidorous (κνισσώδης) and acid (ὀξώδης), marking two of the most ordinary effects of indigestion. In this principle of distinction, Galen was followed by the symptomatic nosologists, who carried it to such a height, that the disorder was decomposed into all its various symptoms, each being made to constitute a distinct and independent disease.

To this error Cullen opposed another, still more pernicious, for he gathered together all the symptoms of disordered digestion, and thus formed his genus, *dyspepsia*; a genus illogically constructed, without species to support or sustain it, in which all previous distinctions were lost and confounded. Cullen, as we have already had occasion to remark, was himself more fully aware of the inconvenience of this arrangement than his followers; but it was not until—recovering the traces of the earliest physicians, and following the more recent examples of Dessault, Richter, Schmucker, and Scarpa,—after having incurred the just criticism of Fischer, a German, and having had the subject boldly unfolded to them by Halle,† a Frenchman, and when the attention of the medical profession of England had been fully concentrated on the disorders of the digestive organs by the writings of Dr. Hamilton (On Purgative Medicines) and

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* Besides *cruditas* and *concoctio tarda*, which are repeated in several places, we have the following comprehensive passage: "Faucibus subest stomachus; in quo plura longa vitia incidere consuerunt. Nam modò ingens calor, modò inflatio hunc, modò inflammatio, modò exulceratio afficit; interdum pituita, interdum bilis oritur: frequentissimumque est ejus malum, quo resolvitur: neque ulla re magis aut afficitur, aut corpus afficit. Lib. iv. cap. v.

† Réflexions sur le Traitement de la Manie atrabiliare comparé à celui de plusieurs autres Maladies chroniques, et sur les Avantages de la Methode évacuante. Mém. de la Soc. Roy. de Méd. 1806, p. 310.

Mr. Abernethy (On the Constitutional Origin of Local Diseases,)—disappointed by the generic treatment and dissatisfied with the generic knowledge of dyspepsia, observant practitioners felt the want of better distinctions; and a spirit of specification commenced, which, still in progress, is yet, we hope, far from having reached its utmost limits. Of this spirit the earliest signs, we think, are to be found in Pemberton (Op. cit.), who was followed by Stone (On Diseases of the Stomach, 1806) and by Warren, (Med. Trans. vol. iv. p. 233.) It is to Dr. G. D. Yeats, (Med. Trans. vol. vi. p. 325,) however, that we are indebted for one of the most important contributions. About this time appeared Broussais, a bold reformer in physic, to whom the world is under deep obligations for subjecting the nature of dyspepsia to a searching analysis, but who in exposing one error plunged into the opposite, perhaps a greater one. With the same object in view, Dr. Wilson Philip, (On Indigestion, 1821,) an original observer, pointed out some valuable practical distinctions in these disorders; and though his work may fairly lay claim to be considered the most comprehensive and the most original which we possess upon the subject of indigestion, we are of opinion that, admitting only one primary form of dyspepsia, he laid too narrow a foundation for rearing a complete and correct classification of this disease. Other candidates have since appeared in the same field of inquiry, who have more or less helped towards the completion of this work. In chronological order, we find Dr. Ayre, (On Marasmus,) who has chiefly considered one form of the disease; our esteemed friend, Dr. Marshall Hall, (On the Mimoses, Lond. 1818—Commentaries on some Diseases of Females, 1827,) a physician of fine and distinguishing observation, who, under the term of *mimoses*, has treated the subject of symptomatic diseases with much judgment and discrimination; Mr. Law, (On the Digestive Organs,) who has made some original observations on the various kinds of costiveness; Dr. Paris, (On Diet,) who, from the physiology of the function of digestion, has deduced some valuable conclusions concerning its disorder: Dr. James Johnson, (Op. cit.,) who has checked and corrected the hasty generalization of Broussais and his adherents; our excellent friend Dr. Sir James Clark, (On the Influence of Climate, &c.,) an acute and a scrupulous observer, who has very accurately described two different species of these disorders; Mr. Cook, (On the Digestive Organs,) an able and observing practitioner, who has illustrated his distinctions of the disease with very interesting cases; and lastly, Dr. Mayo, (Essay on Indigestion, 1831,) who has called the attention of the profession to the importance of considering the influence of temperance in the treatment of indigestion. But it is due to the memory of Mr. Abernethy to state, that, though he did not co-operate in the task of distinguishing and specifying the disorders of the function of digestion, he looked forward to its accomplishment, (The Constitutional Origin of Local Diseases, &c. p. 17, 48,) and insisted on its importance. It is only matter of deep regret that he should have contented himself in his first position, instead of methodizing and digesting his ample store of accumulated experience, and of thus advancing forward to the consummation of his enterprise.

Digestion, like any other function of the body, may be disordered in consequence of some morbid condition of its proper organs, or it may be disturbed in consequence of the morbid condition of the body in general, or of some organ in particular. This affords the leading division of dyspepsia into *idiopathic* or *primary*, and *deuteropathic* or *secondary*, the most important practical distinction of every disease. But the disorder of a function may arise either from some change of action of the organ,—some new modification of its vitality,—or it may depend upon some lesion of structure; from this is naturally deduced the division of *primary* dyspepsia into *functional* and *organic*.

And as the disorder of a function may be either the effect of disease of the whole body, or of some particular organ or apparatus of organs, *secondary* dyspepsia may be conveniently divided into *symptomatic*, forming only a part of a more general disease, and *sympathetic*, the consequence of consent with the disorder of some other organ.

The disorder of the function of an apparatus of organs may either predominate in some particular organ, or may involve the whole apparatus; a consideration which, in the instance of dyspepsia, leads to the distribution of the previous divisions into four natural orders, according as the *stomach*, or *duodenum*, or *colon* is the exclusive or principal site of the disease, or as it involves more or fewer of these parts at the same time; whilst the different morbid conditions which any of the particular organs, or the whole apparatus may assume, afford an easy method of distinguishing these orders into different species. The morbid conditions by which the action of the organ may be modified, have been recognised by the best observers under the terms, *atonic*, *irritable*, *inflammatory*, and *follicular* or *pituitous*: in these morbid conditions, easily cognizable and perfectly capable of verification by the symptoms, consist the proximate causes of functional dyspepsia. Those in which the structure of the organ is altered, admit of being distributed according to the nature of the structural lesion, or as the function becomes disordered by change of capacity, sensibility, or in its secretory function. *Symptomatic* dyspepsia might be divided into species according to the constitutional disease in which it might originate, whether fever, plethora, anæmia, asthenia, or any other form of constitutional disorder; and *sympathetic* dyspepsia would admit of a convenient division according to the organ from whose disorder it took its rise, as the brain, the lungs, the skin, the kidneys, the uterus, or any other organ.

Such is our plan of a complete natural classification of the various disorders of the function of digestion, the result of close and continuous observation, combined with a methodical arrangement of cases; those being grouped together which coincided in causes, symptoms, and means of cure; and each group being denoted by the pathological derangement on which we supposed them to depend. Pursuing this course, it will be observed that we have arrived at distinctions nearly coinciding with those of our predecessors, a strong proof of their correctness, which, verifying our observation by that of the great masters of our art, establishes these distinctions on a long line of uninterrupted experience. But before concluding this part of our subject, we must observe that, whatever objection may be taken to our pathology, to our opinions, or to the terms by which the different species are denoted, it will afford no ground for denying the existence of those species; for being founded on observation and formed inductively, they must survive any error of opinion; and the classification, being natural, has this advantage, that as any new species of disorder of the function of digestion, may be discovered and ascertained, (as no doubt, hereafter, many most certainly will be,) their place or niche will immediately be found without the necessity of the whole structure being broken down and rebuilt, as constantly happens with artificial classifications. The nature of the present work does not, however, admit of the possibility of following up the whole of this plan, and requires that we should confine ourselves to the first division of the subject, *idiopathic functional dyspepsia;* but we shall endeavour, by way of help, to avail ourselves of the corresponding facts of the other divisions, to confirm, explain, or illustrate any part of this. The following outline presents the plan of classification, and enumerates the several species to which we hope to be able to refer the greater part of the varieties of this disease.

IDIOPATHIC FUNCTIONAL DYSPEPSIA.

- I. Gastric.
  - *a. Atonic.*
  - *b. Inflammatory.*
  - *c. Irritable.*
  - *d. Follicular.*
- II. Duodenal.
  - *a. Atonic.*
  - *b. Inflammatory.*
    - 1. *Strumous.*
  - *c. Follicular.*
- III. Colonic.
  - *a. Atonic.*
  - *b. Inflammatory.*
  - *c. Irritable.*
  - *d. Follicular.*
- IV. Gastro-Enteric.
  - *A. Enopathic. The same morbid condition obtaining throughout the whole alimentary canal.*
  - *B. Polypathic. Different morbid conditions existing in differènt parts of the alimentary canal.*

I. GASTRIC DYSPEPSIA.

The disease consisting chiefly in disordered function of the stomach.

I.—ATONIC GASTRIC DYSPEPSIA.

Synonyms.—Απεψίη, πλησμονή, *Hipp;* stomachi resolutio, cruditas, *Cels;* frigiditas stomachi, *Prosp. Alpin;* anorexia, plethorica, arthritica, paralytica; nausea a cacochyliâ; vomitus a saburrâ; flatulentia, acida, nidorosa; cardialgia a saburrâ, paralytica; gastrodynia saburralis, *Sauvages;* dyspepsia idiopathica; anorexia atonica, *Cullen;* saburra materiæ mobilis, *Auctor. Var.;* indigestion, first stage of *W Philip;* dyspepsie, apyrétique, asthénique, *Broussais;* dyspepsié per asthénie de l'éstomac, *Andral;* embarras gastrique.

General Character.—Loss of appetite, sometimes nausea and loathing of food, with occasional inclination to vomit, but seldom sufficient to provoke vomiting; thirst after eating, not after digestion; heartburn; acid, nidorous or putrescent eructations; sense of weight at the epigastrium after a meal; power of digestion more particularly impaired as regards oily, fatty, mucilaginous, saccharine, and acidulous substances; tongue pale, flabby, whitish or slimy, more or less coated; bowels generally confined; urine clear and copious, devoid of its natural smell, deficient of urea, sometimes albuminous, and then disposed to putrefy on standing; pulse somewhat weaker, generally slower than natural; temperature of the body lower than natural and unequally distributed; extremities cold, countenance pale, skin flaccid, eye dull; listlessness in expression, languor in motion; obtuseness of feeling, mind impaired in vigour, in all things a want of alacrity.

These symptoms depending chiefly on the morbid condition of the stomach, are subject to considerable variation from the presence of cruditie, being different as the stomach is full or empty. But the general character of the symptoms is not destroyed by this cause of variation; for, as the different morbid conditions give rise to different symptoms, so the presence of crudities excites symptoms, subject and corresponding to each morbid condition.

The symptoms also vary as they may happen to be direct or indirect, as they emanate immediately, from the suffering state of the stomach, or, mediately, as the suffering of the stomach is felt and reflected in the sympathetic disorder of some other organ. The variation and diversity of the symptoms of atonic gastric dyspepsia arising from each of these sources, will be noticed in describing this disease according to the two forms under which it presents itself, as it takes place suddenly, or as the symptoms manifest themselves in a slow and gradual manner.

a. Acute Form.—In the first case, which might for the sake of distinction be termed *acute atonic gastric dyspepsia*, corresponding more precisely with the ἀπεψίη of Hippocrates, the *cruditas* of Celsus, and the *embarras gastrique* of the French, the disorder comes on in distinct attacks or paroxysms, the patient enjoying in the intervals a comparatively healthy state of digestion. As the disease continues, these attacks are repeated at shorter intervals, whilst the interval itself becomes a state of less perfect health, and the disease, growing more and more habitual, at last arrives at that state in which disorder of the digestion is more or less constantly present, though in a degree less severe than during the intensity of the paroxysm.

These paroxysms vary in their duration from three or four to twenty-four hours or even longer, being shorter in young, and longer and more frequent in older persons and those most disposed to them. As the paroxysms are induced by accidental causes, their return is of course irregular; but, as has just been observed, the liability to them increasing with repetition, slighter causes are capable of inducing them, and they are therefore, *cæteris paribus*, more frequent in old than in young subjects, some suffering a paroxysm every two or three days, others once in two or three weeks.

The patient may have been feeling dull or heavy, have been losing his usual relish for food, may have observed his bowels less regular, or have been complaining of that peculiar sensation at the root of the tongue, and sometimes through the whole length of the œsophagus, which constitutes what is called heartburn; but as it is generally during sleep that the paroxysm comes on, it is in the morning that the symptoms of indigestion are first distinctly pronounced. The patient awakes with headach, or feels heavy and languid, devoid of his wonted alacrity, and indisposed to leave his bed. There is rather flatness than lowness of spirits, with sometimes slight confusion or indistinctness of intellect. The tongue feels clammy, sometimes it is also dry; there is generally an insipid taste, but sometimes it is milky or sweetish, occasionally sourish. The appetite is impaired or entirely deficient, sometimes with nausea, amounting occasionally to a disposition to vomit, and when vomiting does occur, phlegm only is thrown up; or there is a capricious appetite, craving for some unaccustomed kinds of food, but which are seldom agreeable if presented. When the attack is slight, the symptoms are occasionally suspended by taking some grateful food, the action and sensibility of the stomach being revived and restored by being gently solicited. Generally there is an aversion to acids, sweets, or any thing insipid. There may be heartburn, eructations of acid, of oily or rancid matter, sometimes of hepatic gas, or a feeling of weight or load at the stomach, giving the sensation that the process of digestion is entirely at a stand. In other cases there is a sense of constriction of the fauces, with a watery secretion from the back part of the mouth. Sometimes the patient is suddenly awakened by a cramp in the legs, or violent spasmodic pain in the stomach, (*gastrodynia saburralis,*) accompanied frequently with violent retching. The face is pale, the countenance inexpressive, and the eye dull and heavy, with sometimes a dark discoloration or puffiness round the eyelids. The pulse is somewhat weaker, generally slower, usually soft, frequently languid and feeble, sometimes small and quick, occasionally intermitting. The skin is moist, clammy, and flaccid, and generally cold. The feet and hands are cold, with a general feeling of chilliness or creeping over the skin, sometimes amounting to rigors: sometimes there is a particular coldness, stiffness, or numbness of the fingers. The tongue is pale and flabby, generally moist, and covered with a loose slimy white coat, more or less thick. The bowels are constipated; sometimes there is a sensation of naction or of dryness in them. In the commencement of the paroxysm the urine is pale and copious, less frequently it is deficient: but in its decline it becomes high-coloured and turbid, depositng a red sediment of lithic acid, or of lithate of ammonia, or the amorphous sediments of the lithates generally.

The above is an account of an attack of atonic dyspepsia connected with, or arising from, a state of repletion of the stomach; but the same state may arise from that organ being deprived of its ccustomed stimulus or supply, as occurs to delicate people when they pass the hour of their accustomed meal. They have a great sense of weakness, sometimes faintness and trembling; they lose their appetite, have a bitter taste, and a sensation of weight or sinking at the præcordia, their countenance becomes pale and wan, their eyes sunk; they lose their temper and their spirits; their urine becomes hot, scalding, and high-coloured; if they attempt to eat, they have no appetite or a disgust for food, and, if they eat, all their symptoms are increased. They have a difficulty in getting to sleep, or are disturbed with dreams. Giddiness, headach, coldness, trembling, constant yawning, are common attendants of this state of the stomach.

The sympathetic affection most universally connected with this form of disordered digestion is headach, which, being generally associated with nausea, is well expressed by the common term *sick-headach.* (*Fothergill,* Med. Obs. and Inq. vol. vi.) It affects generally one particular part of the head, chiefly the forehead, or is seated over one or both eyebrows, and sometimes in the ball of the eye. The pain is heavy, dull, and overpowering, but seldom acute. With the headach, the whole nervous sensibility appears to be concentrated in the head, where it is much increased, being accompanied with intolerance of light and of noise. The headach begins sometimes to abate on a vomiting of bitter or acid matter, but sleep is the most constant harbinger of relief. As the headach abates, it leaves a general soreness or tenderness of the head, and the squeamishness and general uneasiness continue for some time after.

The other affections frequently observed, sympathetic of *acute atonic gastric dyspepsia,* are a sensation of mistiness before the eyes, indistinctness or offuscations of vision, sometimes amounting to temporary amaurosis, and more rarely, dilatation of the pupil, without any defect of vision; deafness, and sometimes unusual sounds in the ear; loss of smell or taste, or depravation of these senses, so that unnatural smells and flavours are perceived, when there is no external impression; in delicate and sensitive persons, fainting, and in women hysterical fits occur; trismus, convulsions, and, in those predisposed, a fit of epilepsy; loss of voice, paralysis, a fit of apoplexy; spasmodic cough, a fit of asthma or of angina pectoris; neuralgia and various local pains, temporary delirium, a fit of mania, urticaria, erysipelas, and some other cutaneous affections. But many of these complaints are more especially connected with one of the effects of this disorder, distension of the stomach, the direct symptoms of which are restlessness, a sense of oppression, and anxiety.

Causes. — This particular form of dyspepsia most frequently makes its first appearance in early and middle life, from puberty to the age of thirty, less commonly after forty. Women are more subject to it than men. It is more common in cold than in warm climates, in cold than in warm weather; but moist climates and moist weather, whether warm and moist or cold and moist, have a great influence in predisposing to it. The middle and upper stations of life are most exposed to it. The predisposition to this complaint is sometimes hereditary, the person inheriting a relaxed constitution, or one of exalted nervous sensibility, but of weak powers; for it affects rather the cold plegmatic and the asthenic habits than the sanguine or bilious temperaments; and chiefly those of that peculiar relaxed constitution characterized by want of firmness, resistance, and elasticity, by a soft relaxed skin of a pale colour, by a tendency of the hands and feet to be cold, by a languid circulation, by the functions of the body being imperfectly performed, either less actively or irregularly, and by the secretions being rather disposed to be copious than scanty, But this particular constitution may be also acquired by certain habits and manner of living, as by want of exercise, by indolence of body, by indolence as well as by intense or long application of mind, disproportionate to the strength of the body; by effeminate habits and enervating excesses, by the too frequent use of the warm bath, by dwelling in close, warm, ill-ventilated apartments, by sleeping in hot soft beds, and by over-indulgence in sleep. The habits of certain trades and professions contribute considerably to this disease; the confinement to the desk, the sedentary occupations of sempstresses, milliners, mantua-makers, and tailors; those of the loom, of the tambour, of the stocking and lace-frame, and of laundresses who work much over a stove. For all these various reasons, this complaint prevails more in the town than in the country,* and is, as it were, endemic in the boarding-school, the boudoir, and in manufactories; at court, at college, and in prisons; and under the title of *asthenia* has been very well described by Dr. Willan in his account of the diseases of London. The habit which predisposes to this disease may also be a consequence of loss of blood, excessive suckling, seminal weaknesses, leucorrhœa, or any cause which exhausts or debilitates the system in general; of the habitual use of narcotics in excess, as tobacco, conium, or henbane, which injure the sensibility of the nervous system. But the cause which has the greatest influence in disposing to this disease above all others, is habitual incaution in diet, both in respect of kind and quantity of food; for it matters not whether the stomach be frequently offended by that which it cannot subdue, or morbidly distended, and thus rendered incapable of appropriating that which is wholesome. For this reason offences against quantity are not less injurious than offences against quality, and both are doubly baneful when the repast consists of many kinds indiscriminately mixed. To these may be added an irregularity in the times of taking food, the meals being sometimes too frequently repeated, or the intervals too long protracted.

Where the predisposition is strong, or the patient has suffered long, slight causes are sufficient to produce a paroxysm of this form of dyspepsia; but where even neither natural nor acquired predisposition exists, certain circumstances are capable of producing an accidental fit of dyspepsia, and of thus laying a foundation for its recurrence. Amongst such may be enumerated any sudden or unusual disproportion or want of due relation between the digestive organs and the ingesta, a neglected state of bowels, intense application or strong emotions of mind, especially soon after a meal. A sudden fit of passion, or great joy, will sometimes instantly produce this affection. They will also sometimes remove it; "We have more than once," observes Pemberton, "known a necessity for a great exertion of mind to supersede the stomach affection, which has re-appeared on the necessity being withdrawn." Violent exertions or much fatigue of body, either immediately before or soon after a repast; any causes which induce sudden distension of the stomach, as a bulky meal of soft, sweet, pultaceous food, over-indulgence in fruit, large quantities of cold, iced, warm, acid, or sweet fluids suddenly swallowed, more particularly if the process of digestion is still in progress; a sudden change of diet from animal to vegetable food; mucilaginous drinks, &c.; eating hastily after fasting too long, missing the wonted meal, or taking it out of season; taking a cold or warm bath immediately before or soon after a meal; medicines, particularly calomel, conium, henbane, digitalis, ipecacuanha, especially administered at an improper period of digestion; venesection when performed soon after a meal, or leeches applied to the epigastrium under the same circumstances. In the delicate and predisposed, we have observed it excited by variable weather, by exposure to a cold and moist atmosphere, by the application of cold to the skin, particularly to the lower extremities, by sitting in a room of low temperature, so low as to cause a sensation of chilliness, by a change of wind, particularly from a north to a south-west gale.

b. Chronic form.—In this form of indigestion, which might be termed *chronic atonic gastric dyspepsia*, the πλησμονὴ of Hippocrates, the disorder creeps on in a slow insidious manner, and becomes scarcely apparent until it has existed for a considerable time. Some of the following symptoms, more or less grouped and combined together, afford indications of its approach: drowsiness in the day, particularly after a meal; sleep deep, heavy, prolonged beyond the usual hour; the sleep ceases to be refreshing and is disturbed with uncomfortable dreams, sometimes with incubus, and the patient awakes in the morning feeling fatigued, and having a disagreeable taste in his mouth;—less aptitude for exercise, frequent stretching and yawning, torpor or sluggishness in movements, which begin to require a greater effort: diminished activity of mind, mental occupations becoming laborious; diminished enjoyment of the natural appetites, less relish for food, by degrees diminished appetite, especially for breakfast; a sensation of heaviness in the head, of fulness or itchings in the forehead, of fulness or stuffing in the nostrils, particularly after a meal, with a frequent desire to emulge them; a feeling of huskiness in the throat, particularly in the morning, with expectoration of a grey, viscid phlegm, and sometimes an increased flow of saliva. A sensation of fatigue and weariness, sometimes amounting to pain, begins to be felt in the whole or in particular members of the body; a heavy dull pain in the head with drowsiness, a sensation of weight at the stomach, heartburn, or a sensation of internal heat after meals, more especially after breakfast; and the bowels begin to be habitually constipated. These symptoms are followed by distension after eating, by flatu lence when the stomach is empty, at first relieved but afterwards increased by eating; by eructations of the last meal, sometimes acid, sometimes putrescent; by change of complexion, paleness of the face, which is bloated; by deficient alvine evacuations, altogether disproportionate to the ingesta, sometimes by diarrhœa of liquid and undigested food, which affords temporary relief; or by perspiration on the slightest exertion. The disorder may continue for a considerable time in the degree manifested by these symptoms without producing any serious derangement of the health; and, by change of habits, of air, and of exercise, they may be entirely removed. But the long continuance of the disorder brings other derangements. The bowels become habitually confined, and there is a constant sense of fulness, distension, and dryness in them. The repasts cease to be pleasant or satisfactory, but are always followed by oppression; the extremities are generally cold, the power of exercise begins to diminish, the patient begins to lose flesh, and has a constant sensation of weakness, faintness, or trembling, or is troubled with vertigo or headach, with noise in the ears, throbbing of the temples, cough or fits of palpitation. The mouth feels clammy; the tongue is more or less furred, or has a whitish sodden appearance; sometimes the saliva runs from the mouth, and there is a viscid frothy secretion from the fauces, or there is frequent spitting. The skin is generally moist and clammy, sometimes cold; and perspiration is excited by the least exertion. The urine leaves a coating of lithic acid at the bottom of the utensil. The powers of the intellectual faculties, particularly of attention and memory, are remarkably diminished; the feelings are obtuse and little alive; the patient begins to feel flat, dull, and timid without reason, or sinks into a state of apathy or indifference, whilst the physical sensibility becomes morbidly increased, manifested by a remarkable sensitiveness of changes of weather, particularly of the approach of moist weather or storms.

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* At imbecillis stomacho, quo in numero magna pars urbanorum.—*Celsus.*

The further course of the disease is generally very much influenced by the use of remedies, and by the different methods of treatment had recourse to; for if not properly administered, they are mainly instrumental in determining various forms of dyspepsia hereafter to be described. If the disease be allowed to follow its natural progress, it terminates by inducing a disordered state of the function of the duodenum and liver. More rarely the disease undergoes an entire change, which occasionally leads to a natural cure, in consequence of a fixed point of irritation becoming established in the intestines, the activity of the stomach is excited and increased, and the disease is transferred to the intestines in the form of diarrhœa, which, subsiding spontaneously or artificially, leads to a permanent relief of the primary disorder; but which continuing lays the foundation of a form of inflammatory dyspepsia to be treated of in the sequel of this article.

Causes.—This variety of atonic gastric dyspepsia, is, with some exceptions, the consequence of the same causes as those which give rise to the first variety. It is less the effect of hereditary disposition, and more the result of the remote causes of dyspepsia operating insidiously upon a healthy constitution. In this way it is induced in people of regular and orderly lives, who seldom commit any offence against temperance or sobriety, and in people of sedentary, monotonous, indolent habits. It affects literary (Omnesque pene cupidi literarum — *Celsus*,) and professional people, clerks, shopkeepers, and is met with in all constitutions, but in men rather than in women: it occurs generally late in life, and prevails most in winter. A disproportion between food and exercise is the great cause of this disease; but indulgence in much warm liquid, as tea, pre-eminently the English breakfast, in relaxing slops, in meals too frequently repeated, deluging the stomach with tea whilst digestion is in progress, and the habitual use of malt liquor, are the most fertile sources of this disorder.

Pathology. — The morbid condition of the stomach, from which proceed the various symptoms of atonic dyspepsia, has been recognised by the very earliest physicians (Ἀτονίη τοῦ πέψοντος θερμοῦ, καὶ ψύξι τῆς κοιλίης — *Aretæus*,) under the term of *atony*, or some word of corresponding meaning, as *asthenia*, *relaxation*, *resolution*, or *debility*; and instead of this morbid condition of the stomach having been overlooked as the proximate cause of indigestion, it has, on the contrary, been too generally admitted, and the species of dyspepsia which is now under our consideration has accordingly been made to represent the whole genus, every symptom indicative of indigestion, every sign of chylopoietic disorder, having been attributed to debility or want of tone of the stomach.

A state of collapse, of deficient vital power or nervous energy, under various modifications and descriptions, has, as we have already observed, been universally admitted ever since the phenomena of life have been an object of observation. By the operation of certain causes, the whole body may be involved in this morbid condition; by their more partial application, particular parts or individual organs only may be placed under its influence. But as it is the nature of the body for a part to assume the state of the whole, and for the whole body to partake of the action of a part, whether the disorder be at first induced in the general system, or only in some particular part, in either case they both ultimately arrive at, and terminate in, the same condition. The digestive organs are not exempt from the operation of causes capable of inducing this morbid condition, and when the stomach, more especially, is placed under its influence, the disorder of the digestive function which we have just described is the consequence.

But by the term atony of the stomach we express a general and complex condition, resolvable into several subordinate or particular ones; for under it are included—1. a deficient innervation of the stomach, by which some unknown vital action is withdrawn, and the natural affinities of the constituent elements of the alimentary mass, instead of being directed and controlled, obey the laws of inorganic matter, rather than the special influence of organic life; 2. a depraved or deficient secretion of the gastric juice; 3. a diminution of the absorbing power of the stomach, by which the digestion of liquids is rendered more difficult; and 4. a diminution of the contractile power of the muscular fibres of the stomach, by which this organ is prevented from compressing its contents, as in health, that the food and gastric juice being brought into contact may be exposed in successive and appropriate portions to each other's action.

It would not be difficult to trace the process by which the causes of dyspepsia induce the foregoing results. If we consider the nature of their operation, we shall find that they admit of a classification corresponding to the several morbid conditions just enumerated. Thus by sedentariness and repletion is destroyed the healthy equilibrium of waste and supply; for, as has been well observed, as, by virtue of the consent of every part of the living body, all the functions of assimilation can only be preserved in health so long as the stomach digests well, so on the other hand the stomach can only digest well so long as the different functions which convey and deposit the nutritious matter in the various tissues are healthily performed, which, however, cannot be the case when from indolence or similar causes there is both a deficient consumption of this nutritious matter, and a defective elimination of the effete and worn-out particles. The consequence is, that the whole process of nutrition languishes, and the stomach losing the stimulus of demand fails in its activity. This principle, recognised so early as Hippocrates in his famous dictum, *διότι οὐ δύναται ἐσθίων ἄνθρωπος ὑγιαίνειν, ἢν μὴ καὶ πονέη*, explains the operation of many of the causes of dyspepsia, showing how they may induce a deficient innervation of the stomach; and this will be the result whether the equilibrium be destroyed from the consumption being deficient or the supply being excessive. Then we may again observe that some causes induce the same effect by destroying the corresponding and harmonious action of the different parts of the alimentary canal; others by diminishing the natural sensibility of the stomach, either directly, as narcotics, or indirectly, by concentrating the nervous energy in the head, by intense thought and application; whilst others arrive at the same result, diminishing the innervation of the stomach, by withholding or diverting from it a proper and sufficient supply of blood, from which results an unhealthy and insufficient supply of the gastric juice; very contrary to the opinion of Parry, who attributes idiopathic dyspepsia to a morbid fulness of the vessels of the villous coat of the stomach. Other causes act by diminishing the contractile power of the muscular coat of the stomach, either by producing a relaxed state of its fibres, or by sustaining them in a state of unnatural distension, by which they lose the power of resuming their natural state: others effect their deleterious influence by withdrawing from the stomach the healthy and accustomed stimulus which calls it into action, so that it not rarely happens that, after having been more or less stimulated, withdrawing suddenly every source of excitement, the stomach falls into the opposite state, one of perfect atony; and this frequently occurs, whether it be the body in general, or the stomach in particular, which is deprived of its wonted stimulus and excitement.

This view of the operation of the causes which induce atonic gastric dyspepsia, and of the various morbid conditions which they produce, we shall find very much confirmed by considering the state of the body and of other organs in those cases in which this form of dyspepsia is secondary, whether symptomatic of general disorder, or sympathetic of the disorder of some particular organ; for we shall find that the dyspepsia of simple general plethora, (anorexia plethorica,) of asthenia or general debility, (Anorexia exhaustorum, cardialgia lactantium, *Sauvages*.—Dyspepsia paralytica, *Cullen*,) whether induced by venereal excess or weakening discharges, of general anæmia, (Dyspepsia menorrhagica, dyspepsia chlorotica,) whether from loss of blood, or disorder of the process of sanguification, (Halle, vid. Anémie, Dict. des Sciences Méd.,) and the dyspepsia of gout, (Anorexia arthritica, cardialgia arthritica.—*Sauvages*. Dyspepsia arthritica,—*Cullen*,) all belong to this form. In like manner we shall find that the dyspepsia sympathetic of cerebral irritation, (Vomitus cephalalgicus,) of hydrocephalus, of vertigo, (Nausea marina,) and nervous headach, from accidental injuries of the head, from the action of narcotics upon the nervous system, as tobacco, digitalis, hemlock; the dyspepsia which follows a fit of inebriety, (Dyspepsia inebriorum,) the dyspepsia of constipation, the dyspepsia of some forms of disordered uterine function, the dyspepsia of rigid continence, (Nausea a semine corrupto. —*Galen*,) and the dyspepsia which alternates with an atonic state of various other organs, (Gastrodynia metastica,—*Cullen*,) belong also to this form. The dyspepsia which is produced in animals by the division of the eighth pair of nerves, offers a strong analogical proof of the same position.

We may also find the view we have taken of the proximate causes of atonic gastric dyspepsia amply confirmed by examining cases of dyspepsia from organic lesion; for we shall find that, as the organic changes approach the morbid conditions of this form of dyspepsia, the symptoms of atonic gastric dyspepsia are present. Thus, when the stomach has been found unusually large and distended, with or without obstruction of the pylorus; (*Bonet*. sep. iii. vi. 1. *Lieutaud* M. etc. Par. 1756, 223. Cardialgia paralytica.—*Sauvages*. *Johnston*, Med. Observ. and Inq. ii. 107. *Richt*. Chir. Bibl. iii. 78. *Anderson*, Med. Comm. Ed. ii. 294. *Douglas*, M. Med. Soc. Lond. iv. 395. *Abercrombie*, case v. p. 32, p. 70;) thus also in induration and thickening of the coats of the stomach; (*Abercrombie*, xvi. p. 59;) in the early stage of diseases of the pylorus, or where there exists any obstruction to the egress of the chyme from the stomach; (*Abercrombie*, xvii. p. 61. *Bonet*. sep. iii. vi. 2;) in atrophy of the mucous and muscular coats of the stomach; or when the stomach has been found lined with a false membrane; in the softening or solution of the mucous membrane of the stomach, (*Ramollissement des Vieillards*,) to which we may add anæmia of the alimentary canal, which is always accompanied with more or less attenuation of the coats,—a pathological state not rarely presented to the anatomist, but chiefly observed in the bodies of those exhausted by chronic diseases, or who sink during the convalescence of a severe fever; (*Andral*, Path. Anat.;)

in all these cases the disorder of the function of digestion approaches the form of atonic gastric dyspepsia. But though approaching and resembling each other, the two disorders afford data of distinction; 1. by the absence of sympathetic affections; in the organic diseases of the stomach, the sympathetic headach and other disorders being never observed; 2. by the stomach being the seat of painful affections; 3. by the greater constancy and invariableness of the symptoms; and, 4. by the attendant emaciation.

Method of cure.—The treatment of *atonic gastric dyspepsia* is conveniently divided into the means of affording relief when the disorder is actually present, and the means of preventing its return.

I. The means of affording relief when the disorder is present consist in, 1. removing crudities or offensive substances directly from the stomach by vomiting; 2. in endeavouring to remove indigestible substances from the stomach, and restore its action by exciting that of the intestines; 3. by allowing the stomach to repose until its action begins to revive, and by soliciting its action as its sensibility returns; and, 4. by relieving the secondary affections which arise from the disordered function of the stomach.

1. Emetics afford the proper means of removing offending substances from the stomach. In the beginning of a fit of dyspepsia, in the earlier period of the disease, or in cases of accidental dyspepsia, an emetic frequently at once arrests the progress of the disorder, and we have known some persons subject all their lives to frequent paroxysms of the acute form of this disease, who have experienced more relief from emetics than from any other remedy. If, however, the paroxysm has continued long, or the disease has become habitual, they cease to bring their former relief, and, when unnecessarily administered, are always pernicious; (Inutilis est gracilibus et imbecillum stomachum habentibus,—*Celsus*); for vomiting, whether spontaneously occurring or artificially excited, becomes itself a frequent cause of stomach complaints. It was a remedy much used and abused by the Romans, affording them the means of indulging their gluttony; *qui quotidie ejiciendo vorandi facultatem moliuntur:* but it is a short-sighted compromise, granting no impunity; it changes but does not take away the penalty of the vice.

The immediate symptoms which more particularly indicate the administration of an emetic are nausea, a sense of weight at the præcordia, bitter eructations, the internal sensation of crudities, the mouth overflowing with saliva, and paleness of the countenance.

When vomiting is strongly indicated, it is easily excited. The gentlest means are therefore to be preferred, wa[illegible] water, simple, or containing a little culinary salt, warm infusion of chamomile flowers, infusion of mustard-seed, and ipecacuanha, are means of different degrees of power which may be occasionally had recourse to; sometimes simply titillating the fauces answers every purpose. After vomiting, cold water is the best remedy for restoring the stomach; in summer, iced water; sometimes Seltzer water. These should be sipped in small quantities at a time. After a proper interval, a small quantity of light palatable food may be taken.

2. By virtue of the sympathy which exists between different parts of the alimentary canal, the function of the stomach is frequently restored by exciting that of the bowels, and therefore, when the attack has continued beyond that state in which emetics promise relief, or when they have failed of relief, purgatives are to be had recourse to. They should consist of such as are warm in their nature and speedy in their operation, but neither stimulating nor drastic. Rhubarb is decidedly the best. It may be advantageously combined with, and modified in its action by, magnesia, by carbonate of soda, by tartarized potass or soda, in conjunction with some aromatic or carminative distilled water, with a small quantity of the tincture of rhubarb or compound decoction of aloes, and a little of the compound spirit of lavender, or aromatic spirit of ammonia, as the state of the stomach or accompanying circumstances may suggest or indicate. In this form of dyspepsia senna is not proper, and saline purgatives alone are injurious, as are also the mercurial purgatives.

It is generally necessary to continue to promote the action of the bowels during the decline of a fit of dyspepsia, and for some days afterwards. For this purpose a few grains of rhubarb, in combination with a little soda or carbonate of ammonia, taken an hour before the two principal meals, answers very well; or the following formula of Fothergill affords a remedy well suited to this intention:

℞ Alöes ʒi.
Rad. rhei, rad. glycirrh. āā ℥ss.
Spirit. lavend. comp. ʒss.
Aq. calcis, ℥viii.

Infunde per horas xii et cola. Colaturæ cochl. duo bis terve die sumenda. On some occasions it suffices to relieve the bowels by clysmata, and when this method is found to answer, it is always to be preferred.

3. It would seem unnecessary to insist on the necessity of abstinence during a fit of dyspepsia; but it is not always superflous, for the morbid sensations of the stomach sometimes imitate, and are readily construed into, that of hunger. They ought not, however, to be listened to, for abstinence is the chief remedy. The patient may drink, from time to time, a small cup of green tea, without sugar or milk, or a cup of coffee, moderately strong, with as little as possible of those ingredients; or he may take a small quantity of light pure broth, sufficiently sapid to be agreeable, with a small quantity of stale bread or dry toast. As the natural sensibility of the stomach returns, it may be solicited by a little animal food, such as is palatable and easy of digestion. If the patient is accustomed to the use of wine, but not otherwise, it may be necessary to allow a moderate quantity with the meat: the red wines for this purpose ar generally to be preferred. Farther than this the stomach is not to be excited. All such means of doing so, as brandy, capsicum, or food containing it; mustard, piquant sauces, curries, or high-flavoured dishes, are to be avoided. In this category we would also place bitters, and those medicines improperly termed stomachic. The action of the

stomach ought never to be hurried or forced by stimulants; it can only bear them when its function has been already to a certain degree restored. Before this period they only tend to fix the disease. The state of the tongue affords the best guide for the use of food and its quality; as it is moist and disposed to clean they are admissible, and as it is dry they are to be forbidden.

4. Besides the general treatment of a fit of dyspepsia, there are painful symptoms and sympathetic affections which ought not to be overlooked, and, indeed, the relief of which is not without its influence upon the primary disease. But in administering means of relief for such affections, it is important to take care that they do not oppose, but are made subservient to, the plan of general treatment.

Heartburn.—Dr. Fothergill's formula, mentioned above, affords a good corrective of this symptom; magnesia, liquor potassæ (gut. x. pro re natâ), ammoniæ subcarbonas (gr. v.), lime-water; sometimes alkalies combined with bitters. We have found Seltzer water a very excellent remedy; and at other times repeated small quantities of very cold or iced water, taken when the stomach is empty. Heartburn which is habitual or of long standing is sometimes more effectually relieved by acids than by alkalies. Pemberton mentions having seen it subdued by the juice of half-a-dozen lemons taken daily, and recurring on the remedy being left off; but we imagine that the heartburn here meant is not that which proceeds from acidity, but the burning sensation depending upon a heated state of stomach, a symptom of another form of dyspepsia. In heart-burn, nitric acid is also a useful remedy; five drops of the diluted acid may be taken every four hours. We have also used successfully the phosphoric acid with the same intention, and have found it more agreeable to the stomach.

Flatulence.—This symptom is best relieved by combining a carminative with the aperient. Equal parts of the pil. rhei comp. and pil. galbani comp. form a convenient remedy; carbonate of ammonia in mint-water; very hot water in small quantities after a meal, is sometimes found a very efficient corrective of this symptom.

Distension of the stomach from flatulence to an extreme degree, in old people, is often attended with alarming symptoms, sometimes convulsions, sometimes apoplexy. By extreme distension the muscular coat loses its contractility, and the mucous membrane its sensibility, and thus the usual remedies lose their power. In such cases mustard poultices applied to the pit of the stomach are of great service, whilst the internal means are put in use. The best of these are ammonia in infusion of horse-radish or of mustard-seed, and repeated draughts of water as hot as it can be taken. In extreme cases the use of the stomach-pump should not be omitted.

Nausea and Vomiting.—When these symptoms continue after the stomach and bowels have been satisfactorily relieved, effervescing saline draughts, especially those prepared from the subcarbonate of ammonia, are suitable remedies; to these, if the symptoms are urgent, may be added a little spirit of lavender, camphor julap, and, in case of necessity, one or two minims of the "black drop." The hydrocyanic acid (gut. i. ad ii.) has been also used with considerable advantage; but we believe it to be more efficacious in the other forms of dyspepsia.

Headach.—When this symptom does not subside with the primary affection, it may be relieved by valerian (tr. valer. ammon. or infus. valer.) either alone, or combined with camphor; if attended with sleeplessness, a small dose of pulv. ipecacuanhæ comp. may be given in camphor mixture, or a saline draught; or if heartburn be present, may be combined with magnesia or liquor potassæ. But a warm pediluvium, containing mustard or culinary salt, or evaporating lotions of vinegar, spirits of lavender and rose-water, applied to the head, are sometimes more efficient than internal remedies.

It would be extending this article too far to enter into the treatment of the other various secondary affections of this disease; we must content ourselves with referring to the symptomatic form of each of these disorders.

II. Having afforded relief to the urgent state of indigestion, it is the duty of the physician to direct his attention to the means of obtaining a permanent cure, which consists more in prevention than in positive remedies. The object to be held in view in the prevention of a disease has been clearly and succinctly expressed by Celsus—"quod vel corporis vel loci, vel studii ratio detrahit, cura restituat." Guided by this general view, seeking if possible to avoid or remove, if not to counteract the causes of the disease, we shall endeavour to fulfil this intention by indications derived from the nature of the operation of the causes in which it originates, and from the morbid condition of the stomach in which it consists. These indications serving as principles to direct our prophylaxis, and applicable, with some small modification, to every form of dyspepsia, may be stated to be—1, to render the process of digestion as easy as possible by a selection of food of a quality suited to the nature of the disease, and by a proper adjustment of the quantity suited to the power of digestion; 2. to excite the function of nutrition by proper exercise of body and mind; 3. to correct the morbid condition of the stomach, the proximate cause of the disease.

1. This is beyond all comparison the most important point in prevention of this disease; the reducing the quantity of the food to the power of digesting and of appropriating it, instead of yielding to the cravings of a pampered appetite. The change ought to be brought about gradually, for in that way it is most agreeable to the habits of the body, and most likely to be persevered in; and if the diminution of diet is made with judgment and selection, it ought to be effected by withdrawing from it such articles of food as are difficult of digestion, and such as have a tendency to weaken the stomach. The object is best attained by confining the patient to a small spare diet of animal food, with considerable restriction in the use of fluids. It is in this form of dyspepsia that so much benefit has been obtained by strict adherence to a dry diet, and by avoiding a bulky meal. When the appetite flags, abstinence will be found a better whet than cordials, stomachics, or dainty fare. When the appetite does not fail, the patient

should finish his meal without waiting for the sensation of satiety, taking care that he be not deceived by a morbid craving, the offspring of disease and bad habit, not of health. When any doubt as to quantity may arise, he may be assured that it is safer to err by taking less than enough than more than enough—"nunquam utilis nimia satietas, sæpe inutilis nimia abstinentia."

For breakfast coffee is to be preferred to tea, and should be taken with as little milk and sugar as possible, and with a moderate quantity of bread, which, with a little fresh butter, should form the repast. It is necessary that the bread should be limited, for if taken in excess it is a common cause of heartburn after breakfast. The dinner should consist of the lean of animal food, chiefly mutton, poultry, venison, game, with the exception of hare. Roast meat is to be preferred to boiled. Vegetables are to be eaten sparingly, or entirely abstained from; mealy potatoes mixed with the gravy of the meat, asparagus, soft young summer turnips, cauliflower, or French beans, are the only kinds admissible. Rice mixed with the gravy of the meat will be found a good substitute for vegetables. Eggs lightly boiled may be occasionally used. The fruits the least offensive are strawberries, the morel cherry, and the mulberry; but they should be eaten in the early part of the day, and never after dinner. Fluids must at all times be taken with the greatest moderation; the patient should not yield to every slight sensation of thirst; they should be taken slowly, a small quantity at a time, and should follow, never precede the meal. If the weakness of digestion or habit demand a stimulus, port wine and water or sherry and water are the best; malt liquors are to be particularly avoided. Three moderate meals is the best general rule for the periods of eating, taking care to eat nothing in the intervals, and avoiding suppers. It may be stated also as a general rule, that the food and drink in this form of dyspepsia should be taken decidedly hot or cold, not tepid; that twice dressed meat should be scrupulously avoided; and that the meat should be eaten slowly, and thoroughly masticated.

It may not be easy to say strictly what kinds of food are wholesome and what are unwholesome, but there are some so decidedly so, that there can be no dispute about them. Dr. Mandeville's definition of wholesome, "what you like and does one no harm," allows a deceitful latitude to dyspeptics. The admonition of Celsus carries a stronger impress of wisdom and experience; "non quicquid boni succi est, protinus stomacho convenire, neque quicquid stomacho convenit, protinus boni succi est."

The kinds of food most decidedly injurious in this form of dyspepsia, and therefore to be avoided, —fluid food, more especially that which is sweet, mucilaginous, or acid, such as contains much milk; all pultaceous diet, puddings or compound dishes, particularly meat pies or meat puddings; new bread, particularly with butter; heavy unfermented bread; hard-boiled compact fat dumplings; all preparations of milk, whether custards, creams, curds, or cheeses; all fat meat, particularly pork or bacon; all young meat, and all the gelatinous parts of meat; all salted or smoked meat; strong broths, gelatinous soups, or highly concentrated dishes; fish; melted butter, oil, sauces, spices, condiments, and pickles; all vegetables, more especially roots, with few exceptions,* particularly peas, beans, cabbages, waxy potatoes, cucumbers, and pot-herbs generally; fruit in general, whether fresh or preserved, jellies of fruits, figs, dried as well as green, currants, gooseberries, pears, apples, plums, apricots, melons, and all kinds of nuts or kernels; mushrooms, truffles, and morels; treacle and honey; malt liquor, particularly ale; perry, home-made wines, punch, shrub.

2. In the early stage of dyspepsia an increase of exercise admits of greater latitude of diet; when more advanced, it affords no exemption from strictness of regimen. But by exercise we do not mean those nominal kinds in which half of the body only is exercised, as a quiet sauntering walk or the passive exercise of a carriage;—we understand active exercises, in which every part of the body is more or less in motion, sometimes one, sometimes the other. In persons of weak digestion the ancient physicians used to insist upon the exercise of the superior extremities, and we fully understand the nature of their advice.† It is impossible to lay down any precise rule for the extent of exercise, which must be proportioned to the strength and even the habits of the patients; but it should be continued for at least two hours daily, and be sufficient in degree to produce gentle perspiration.‡ The patient should by degrees overcome his habits of sedentariness, commencing by taking gentle exercise on foot and horseback between breakfast and dinner; he should then extend the period of his exercise, and, if possible, rise in the morning so as to allow of a little before breakfast; but this should always be the least fatiguing. As his strength increases, he may proceed to more active exercises, strong enough to excite perspiration, but not fatigue; such as walking over unequal ground instead of plain, climbing ascents, rowing, digging in a garden, cutting and clearing wood, drawing weights over a pulley, turning a heavy windlass, as in grinding malt; military exercises, drilling, or the gymnastic exercises; or such amusements as field-sports, as coursing, fox-hunting; swimming; or such active games as cricket, fives, racket, bowling, foot-ball, fencing, the broad-sword, or single-stick, or playing at quoits. Sometimes it is necessary to impart interest to exercise. In such cases gardening, agricultural occupations, the practical study of botany, geology, entomology, have been found of eminent service. On this subject Dr. Cullen says, "as a bodily exercise I can say that walking has good effects. I have always thought it necessary to continue other amusements or business; and there are several instances of persons, who have long laboured under weakness of the stomach, being cured by watching the concerns of their farm, which obliges them to be much

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* The abstinence from vegetable food, which is a painful privation to most persons, might possibly be obviated by using a digester, by which the vegetables might be submitted to a temperature considerably higher than that of boiling water. The ancients considered the cabbage race of vegetables as rendered more wholesome by boiling them in two waters.

† Maximeque quæ superiores partes moveat, quod genus in omnibus stomachi vitiis aptissimum est.—*Celsus.*

‡ Exercitationes autem plerumque finis esse debet sudor, aut certè lassitudo quæ citra fatigationem est; idque ipsum modo minus, modo majus.—*Celsus.*

in the open air, and in constant gentle exertion. I have cured weak stomachs by engaging the persons in the study of botany, and particularly in the investigation of our native plants, and in other gentle and long-continued amusements, such as our game of golf." (Op. cit.) It was observed during the late war, that many of our tradesmen who joined the volunteer corps, were, by their regular military exercises, entirely cured of their dyspepsia. When the weather does not admit of exercise in the open air, reading aloud, reciting, singing, flute-playing, the dumb-bells, battledoor, dancing, skipping, and such-like, afford useful substitutes.

Exercise should always precede a meal, and never follow it; neither should the patient sit down to eat in a state of fatigue or exhaustion. A little interval between exercise and eating is on that account desirable; and this interval would be advantageously employed in gentle friction with a flannel glove, (made best of a piece of coarse blanket,) or the flesh-brush. No active exercise should be used for at least two hours after eating.

It is an old rule of philosophy as well as of physic, that the body cannot be properly exercised without the mind, nor the mind without the body. This rule emanates from the twofold function of the nervous system, which not only supplies the vital energy or power by which the entire process of organization is carried on, but also that by which the more distinctive offices of animal life, intelligence and voluntary motion, are performed. If the power of the body be occupied exclusively in either of these, the other languishes. Many familiar illustrations of the truth of this position will readily present themselves. Long-continued or intense application of the mind does not derange the function of digestion negatively, by interfering with the opportunities of exercise, but positively by withdrawing a portion of the power by which it is carried on. Indolence of mind, on the other hand, does not interfere with the function of digestion by withdrawing the power, but by withdrawing the stimulus, the pleasurable enjoyment which well-regulated occupation of the mind imparts to the whole functions of life. The functions of digestion may be deranged by three different states, obtaining between the exercise of the body and the occupation of the mind: 1st, the most usual, a total inaction and inertion of the body may coincide with a fatigued and exhausted state of mind; 2dly, a state of indolence and sluggishness of mind, with inertion of the body; or, 3dly, a fatigued and exhausted state of body may coincide with a wearied and worn state of mind. The two first cases only apply to the present form of dyspepsia, and the indications deducible from them readily suggest themselves. The studious should, therefore, relax from their application, nor urge and overstrain the attention too long and too far; and though entire repose may not be allowed, their studies may be varied, that the different faculties of the mind being exercised* may relieve each other. It was a correct observation of a learned physician, that indigestion follows learning as close as the shadow follows the body, "Omnesque pæne cupidi literarum" Celsus considers the most constant sufferers from dyspepsia; and Aretæus has painted with his most vivid colours the painful sufferings which await a devotion to science and letters, θείης μὲν μαθήσιος ποθῇ, when ill regulated and unrestrained. If study cannot be dispensed with, at least all application soon after a meal may be abstained from.† The indolent, on the other hand, should seek occupation, and thus avoid the pains of inertion. But in making these changes, care is to be taken to avoid running into the opposite extreme. Fatigue of body discomposes the sedentary, vacuity of mind is irksome and oppressive to the learned and to the man of business, and much study or business overcomes the indolent. Let them seek, then, occupations in which exercise, amusement, and interest may be happily combined, for they may rest assured it is a policy both narrow and short-sighted, which does not allow some hours a day to the care of their health. "Quem interdiu vel domestica vel civilia officia tenuerunt, huic tempus aliquod servandum curationi corporis sui est." (*Celsus.*)

3. This indication, correcting the morbid condition upon which the disease depends, according to our pathology, subdivides itself into (*a*) endeavouring to restore the harmonious action of the different parts of the alimentary canal; (*b*) restoring or increasing the activity of the excretory organs, and (*c*) restoring the tone, or improving the innervation of the stomach.

a. To restore the corresponding and harmonious action of the different parts of the alimentary canal. In health there exists a sympathetic relation and corresponding action between the different portions of the alimentary canal. Whilst some are in action, others are in repose, or the action of one part induces that of another. This relation is most remarkable between the stomach and larger bowels; and it is frequently one of the first effects of the operation of the causes producing dyspepsia to destroy or derange this relation; either by the patient not lending a ready obedience to the calls of nature, by losing the habit of it, or, by the sensibility of the stomach becoming altered, the natural intimation ceases to be transmitted to the bowels, and then the parts lose their correspondence. This state is to be corrected by endeavouring to restore the habit of a daily evacuation after the first meal, which is natural to most people in health. For this purpose the water-closet is to be visited even when there is no call from nature. When this does not succeed, the patient may relieve the bowels every second morning by a lavement of warm water. He should only have recourse to aperients when neither of these means succeed, but which will seldom be the case if he has observed those rules of diet, exercise, and occupation pointed out in the first indication; and whatever artificial means he may have recourse to, he should every now and then afford nature an opportunity of righting herself. Another method in common use, that of resorting to vegetables and fruit and coarse bread, seldom succeeds in this form of dyspepsia, or does so only temporarily; a mild aperient is on the whole more expedient and less pernicious. The best form of aperient with which we are acquainted is the pulv. aloes comp. (gr. v.)

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* Levet quoque lassitudinem etiam laboris mutatio: eamque quem novum genus cujusdem laboris pressit, id, quod in consuetudinem est, reficit.—*Celsus.*

† Sin lucubrandum est, non post cibum id facere, sed post concoctionem.—*Celsus.*

or the following:—R. Pulv. aloes spic., pulv. rhei, pulv. g. guaiaci āā ℈i. Pulv. ipecacuanhæ gr. iv. Ft. pil. xii. Una vel binæ pro re natâ sumendæ. The pil. galban. comp., the pil. scillæ comp. may be sometimes advantageously substituted for the guaiacum. From five to ten grains of the inspissated residuum of the evaporated decoct. aloes comp. prepared with carbonate of soda instead of potass, or of the baume de vie, affords a mild and easy aperient.

The physician should be economical of his means, and not expend his resources unnecessarily. By this precaution he will both spare the power of the organ and of the remedy. If the habitual use of aperients is established, their power must be increased, and at last even strong remedies fail in their effect. The limitation of Celsus, with regard to aperients, is consistent with his wonted prudence; "dum et modo et non nisi quum opus est adhibeatur;" and his reason in accordance with daily observation, "assuecit enim non ali corpus, et ob hoc infirmum erit." This morbid condition will be also corrected by the means used for invigorating the function of the stomach itself. The restoration, however, of the natural relation of the stomach and bowels often suffices to restore the healthy action of the stomach and of the whole function of digestion.

b. The equilibrium of supply and waste of the body may become deranged through inactivity of the excretory organs, a common effect of sedentary and indolent habits, and not always removed upon changing them. The bowels, the skin, and the kidneys may become torpid in their action; the effete parts not being carried off, the process of nutrition flags, and the digestion fails; a stagnation takes place in the extreme vessels, the whole reproductive processes go on sluggishly, or are entirely at a stand, and the stomach in this way loses its stimulus and impulse. This state is to be corrected by giving activity to the excretory organs; and it is a method of restoring the equilibrium often had recourse to, but ought only to be used when the foregoing methods fail; for it is neither so safe, so salutary, nor so permanent as increased exercise and diminished diet. We have frequent instances of its efficacy in the use of alterative remedies, as is shown in the vigour of nutrition which sometimes follows a course of mercury, or a course of alterative mineral waters. When expedient to be used, a continued source of alterative saline purging affords the best means of effecting it, and most efficiently the mineral waters of Carlsbad or Marienbad.

Besides these means of restoring the desired healthy equilibrium of supply and waste, it has been observed that the same may be temporarily obtained by diminishing the volume of the circulating fluid; and on this principle many cases of this form of dyspepsia, originating in a bloated or plethoric state of the system, have received considerable relief by letting blood. It is a plan well to know, but seldom to be followed.

c. The morbid condition of the stomach which constitutes *atonic gastric dyspepsia*, may be corrected, and the tone of the organ restored, either directly by means applied to the stomach, or indirectly by means acting upon the system at large.

1. Of the direct means which have the power of rousing and invigorating the stomach, in our opinion wine in moderate quantity is not only the most grateful but the most useful. The dry wines are to be preferred, as pale old sherry, diluted with equal parts of water, or old port wine and water, good claret, or white hermitage, sauterne, or hock. Some persons find a little brandy and water agree better than any kind of wine. It is sometimes of advantage to administer these stimulants very cold or very warm, but never of a tepid temperature.

The medicines comprehended in the list of bitters, tonics, and astringents, have also, in a certain degree, the power of correcting the relaxed state of the stomach. But their power in this respect has been very much overrated, which has led to their abuse, and to the exclusion of more rational and successful means. According to our experience the following are the medicines of this nature best suited to this disease:—lime-water, alone or mixed with some aromatic or carminative water (the distilled water of orange flowers best conceals its taste); the infusions of calumba, chamomile, cascarilla, orange-peel, or wormwood, alone, or in combination with carbonate of soda, or ammonia; camphor julap, mineral acids, the acid. sulphur. aromat., the diluted sulphuric acid combined with tincture of hops, or tincture of cardamoms; the phosphoric acid in the same way; the metallic tonics, as the tr. muriatis ferri alone, or in infusion of quassia, the subnitrate of bismuth, or the sulphate of zinc.

Of all the remedies of this description the best are the carbonated chalybeate waters, as those of Spa, Pyrmont, Schwalbach, and Eger, on the continent, or their imitations so accurately and scientifically prepared by Dr. Struve at Brighton; or those of Tunbridge Wells. In administering these remedies, it ought not to be forgotten that they are contra-indicated if any derangement of the biliary secretion be present.

The intention of this indication is sometimes more safely and completely fulfilled by combining tonics with aperients, as the powder of calumba with rhubarb and carbonate of soda, sulphate of iron with extract of aloes, subnitrate of bismuth with rhubarb and aloes, the sulphate of quinine with aloes, or extract of colocynth.

The stomach may also be acted upon by external local applications, as by warm stimulating plasters, but more efficiently by the cold douche to the region of the stomach. The ancients held this remedy, to which they gave the name of *cataclysmus*, in high estimation.* They used chiefly the cold douche, either of sea-water or mineral springs. Those of Cutilia, Simbruinum, and Nepete, were most in repute, now almost unknown; for the modern Italians prefer the indulgence of the thermal springs, which they use in precisely the same manner.

2. The indirect means of restoring the tone of the stomach consist in avoiding all the causes which tend to weaken, enervate, or exhaust the body or mind, as over-indulgence in sleep, and hot beds, lustful excesses, hot and ill-ventilated apart-

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* Hinc perfundi frigidâ, atque in eadem natare, canalibus ejusdem subjicere stomachum ipsum, et magis etiam a scapulis, id quod contra stomachum est.—*Celsus*. Ægrotante maritimæ natatione exercendi atque *cataclysmo*, hoc est, aquarum illisione, suppositis partibus — *Cæl. Aur.*

ments, moist climates, the too frequent use of the warm bath; and correcting or removing those habits or states of body which have the same effect, as leucorrhœa, or other weakening discharges; habitual venesections, chlorosis, and such-like diseases. The hours of sleep should be diminished; the patient should retire to bed early, and should rise in the morning soon after waking; he should sleep upon a mattress, in a bed without curtains, and should be careful that his chamber is well ventilated and dry.

The clothing of the body should be rather cool than warm, but sufficient to prevent the feeling of coldness; without being oppressive, it should be sufficient to protect the patient from the inclemencies of the weather. It will be at all times desirable that the lower extremities should be kept in a state agreeably warm.

If the patient have the power, he should select for his residence a dry climate, either cold or mild, such as is found in England at Brighton, Tunbridge Wells, Clifton or Malvern; in Switzerland, at Berne or Lausanne; in the south of Europe, at Nice, Genoa, and Naples. He should inhabit airy and well exposed apartments fronting the south-east, so as to have the forenoon sun, and should be cautious not to dwell near rivers and marshes.*

Much of the baneful effects of prisons, manufactories, and places of a like kind, might be corrected by proper ventilation, by the use of the *cheminée d'appel* and similar expedients.

The patient should pay particular regard to cleanliness of his person; he should use freely the ablution of cold water, sometimes to the whole, sometimes to parts of the body; he should sponge the body every morning for a considerable part of the year with cold vinegar and water, or salt and water, much used by the ancient physicians under the name of *ψυχρολουσία*—*frigidi consuetudo lavacri*—and should afterwards rub the body well with a coarse towel; at another period he may use the shower-bath, the cold sea plunging-bath, or the cold fresh-water bath, or exercise himself in swimming; and when none of these means can be used, he should not omit dry friction of the body with the flesh-brush or a flannel glove, a salutary exercise for the indolent, and a useful substitute for it in the convalescent, or those who have not the benefit of locomotive exercise. The patient should pass much time in the open air; he should change his air from the town to the country, from the plain to the mountain, from the sea-side to the inland parts; (Adhibitâ mutatione longâ, terrenâ et maritimâ,—*Celsus*); or he may find a continued change by a well-planned, not hurried, tour, the most effectual. Of exercise as an alterative we have already spoken; as a tonic it is not less to be regarded; and to both these means—air and exercise—respiration and perspiration—we agree with Aretæus in granting a peptic power greater than medicine. (*Ἔχει γάρ τι ἡ διαπνοὴ καὶ ἡ ἀναπνοὴ τοιόνδε φάρμακον πεπτήριον.* De Cur. Mor. Diut. lib. i. cap. 7.)

We must bring our method of curing this form of dyspepsia to a conclusion with observing that though complete success is only to be expected from a steady perseverance, it will not be so readily obtained by strict and undeviating monotony. No regimen of the body is perfect which does not leave room for variety. It is the nature of the body as well as of the mind to desire and require novelty. The same diet long continued becomes loathsome, the same exercise irksome, the same occupation uninteresting, the same medicine inert and powerless. The very disease we are endeavouring to cure may in our opinion be induced by too strict an adherence to one regimen long-continued. "Quod enim consuetudinem est, nocet, seu molle, seu durum est." It is, therefore, the duty of the physician to be well stored with a diversity of means equivalent, but not identical, all capable of effecting the same object, by whose changes, substitutions, and modifications, he may keep alive the languishing resources of the body, drawing a lesson from the wisdom of nature, which has provided us with such an ample variety, that every year hath its own peculiar character, every season its food, every day its weather, every hour its temperature, and yet all are uniform, consonant, consistent, but subservient. And so our methods should be diversified in their details and particulars, but uniform in their general plan and spirit. In this principle of variety, this law of our constitution, are explained the astonishing effects of change of air and climate in the disease of which we have been treating, in which is comprehended the change of all our habits, of diet, exercise, and occupation.

But our advocacy of variety in means and method, is not opposed to perseverance in a plan of regimen, but in support of it, the most efficient way of giving it the permanency of habit and success; and even after success, neither may the regimen be relinquished. "Illud quoque in omnibus stomachi vitiis præcipiendum est, ut quo modo se quisque refecerit, eodem sanus utatur; nam redit huic imbecillitus sua, nisi iisdem defenditur bona valetudo, quibus reddita est." (*Celsus.*)

II. Inflammatory Gastric Dyspepsia.

Synonyms.—Stomachi œstus et inflammatio, *Cels.*; passio stomachica stricturæ, et cynanche stomatica, *Cæl. Aurel. et Method.*; stomachi adstrictio, *Ætius*; Cardialgia inflammatoria, et à veneno, gastrodynia adstringens, pyrosis à phlogosi, et Suęcica, et anorexia canicularis, hypochondriasis sanguinea et algida, *Sauvag.*; Gastritis erythematica, *Cullen*; Gastrite chronique, *Broussais.*

General Character.—Painful digestion, sense of heat, tenderness, or pain at the epigastrium, increased upon taking food, or pressure; thirst; tongue more or less of a bright red colour, sometimes of a brownish red, sometimes dry, glossy, and adhesive; taste saltish or alkaline, occasionally like that of blood; bowels generally confined; urine high-coloured; skin dry, occasionally profuse, partial sweats, chiefly in the direction of the extensor muscles; temperature of the trunk increased, of the extremities diminished, except occasionally in the palms of the hands and soles of the feet, which, especially at night, are frequently dry, hot, and burning; aggravation of the symptoms under the use of stimulants or irritating ingesta.

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* Habitare vero ædificio lucido perflatum æstivum, hibernum solem habente, cavere meridianum solem, matutinum et vespertinum frigus itemque auras fluminum atque stagnorum—ne modo frigus, modo calor noceat.—*Celsus.*—See also *Dr. Clark's Treatise on Climate.*

Forms of the Disease.—As this disease may present itself in different degrees of intensity, the symptoms are liable to a corresponding variation.

In its lowest degree it is not manifested by loss of appetite, but by increase of thirst, particularly during the night, by increased heat of the skin, flushing of the face, and redness of the conjunctiva, particularly after meals, by disturbed sleep, unpleasant dreams, and by the patient awaking wearied and unrefreshed. The tongue on its anterior half is of a red colour, brighter than natural, often by superficial observers mistaken for a clean tongue; it is seldom dry except during sleep, but soon dries on exposure, and is generally found in this state on awaking; sometimes there is an increased flow of saliva, particularly during sleep, sufficient to leave large stains upon the pillow. When the stomach is loaded with crudities, the tongue is covered with a brownish yellow fur towards its base. The lips are generally dry, and of a glossy red colour, the fauces dry, flushed, or erythematous. The bowels are confined, only dry scanty stools being voided; the urine is scanty, but clear and high-coloured; if any sediment be deposited, it is small in quantity, forming a thin lateritious coating on the bottom of the vessel. The pulse is somewhat harder, more contracted, but seldom much accelerated except during digestion. Cotemporaneous with these may exist various secondary symptoms, such as a painful sensation of tension in the head, increased on motion and after eating, or a painful pulsating tension, sometimes a sense of fulness; pain between the scapulæ,* pain of the left side, left shoulder, or left arm, and sometimes local pains in various parts of the body, often felt most acutely on awaking; eruptions of the skin, chiefly *lichen*, *erythema*, *urticaria*, *psoriasis*, and *pityriasis*.

In a more advanced stage of the complaint the patient begins to refer his sufferings to the seat of his disorder. He complains of a burning pain at the pit of the stomach, which is much increased upon pressure, and after taking food; or of a sensation of oppression at the stomach, with great uneasiness and discomfort during the digestion of his food, which is generally also accompanied with flushing of the face, acceleration of the pulse, and frequently a tense pulsating headach. If the appetite is not impaired, it is sooner satisfied, and taking food sometimes causes nausea. There is considerable thirst; the face is red and swollen, the eyes are red, the lips red and parched, sometimes blistered and swollen; the tongue is either of a bright glossy red, sometimes smooth, having the papillæ obliterated, disposed to be dry and adhesive when touched, or of a brownish red colour, or presenting a red ground covered with a thin film of the colour of coffee; small vesications or ulcerations are common upon the tongue, upon the inside of the lips and cheeks, and the mouth generally, which is also redder than natural. The fauces are also red, presenting an erythematous blush; they are generally dry, and frequently the seat of ulcerations. The taste is saltish or alkaline, frequently corresponding precisely to that produced by nitrate of potass; there is also very often a sensation of heat or of scalding at the point of the tongue, such as follows the taking very hot soup. The bowels are constipated, the urine is scanty and of a high colour; the skin dry and harsh, except during sleep, when the patient is sometimes bathed in a heavy transient sweat; the pulse is now permanently quicker than natural, small and contracted, but always quicker and stronger during the progress of digestion; the temperature of the body is increased, and the patient complains of burning of the palms of the hands and soles of the feet at night; the sleep is disturbed by painful or unpleasant dreams.

The preceding symptoms, the constant signs of the disease, may be obscured or thrown into the shade by some of the more prominent secondary affections, often the chief subject of the patient's suffering and complaint, and of the physician's attention. The principal of these are headach, a tense splitting headach, increased by motion, by stooping or eating, sometimes deep pains plunging through the head; these are accompanied with a morbidly increased sensibility to light, sound, and all impressions; pain in the left side, in the left hypochondrium extending to the shoulder and arm, pain of the back between the scapulæ, particularly severe on awaking; strong and painful pulsation of the heart, increased in impulse, bearing all the appearance of hypertrophy of the ventricles; inflammation of the eyes or eyelids; soreness, redness, and ulceration of the membrane of the nose; eruptions of the skin, chiefly scaly and exanthematous; suppression of the menstrual function for a time, not unfrequently followed by increased menstruation. With these are conjoined more or less peevishness of temper, irritability of feeling, sullen oppression of spirits, anxiety or restlessness of disposition, all strongly though not elegantly expressed in the words of Cælius Aurelianus; "animi augustia, jactatio, anxietas, sive concatenatio mentis et desponsio."

In a more acute degree of the complaint there is a total loss of appetite, or disgust for food, which on being swallowed causes nausea or is instantly vomited. There is an indistinct dull pain across the pit of the stomach, or a sensation of constriction as if something were tied tightly across it. The pain is increased on pressure, and sometimes a strong palpitation is felt at the same time. Frequently the pain is felt more in the chest, or the patient complains more of darting pains under the breast, which, being accompanied by a hard dry cough, bears all the appearance of, and is not unfrequently mistaken for, a pulmonary affection, but which may be easily distinguished from it by the cough being always excited by stimulating ingesta, by its returning in paroxysms, by the accompanying state of the tongue, and by the general complexion of the disease. The features are drawn and dejected, the face flushed, and the forehead moist and clammy; the lips are red, the conjunctiva injected, and the eyes prominent. There is considerable thirst; the tongue is dry and parched, sometimes hard and scabrous, it is generally of a brick-red colour, or it is covered with a thin brownish mucous crust; sometimes it presents the appearance of raw flesh, and has been not inaptly compared to a beefsteak or cleanly dissected muscle. If crudities be present in the stomach, which is, however, seldom the case, or if a saburral be added to an inflammatory state of the mucous membranes, the root of the tongue is loaded with a yellowish white fur, whilst its point and edges are of a bright red colour, or the papillæ are prominent, projecting through the fur; the breath is fetid and the taste bitter. In this state only are there ever acid, nidorous, or fetid eructations. The throat is sore, the fauces are erythematous, and, together with the inside of the mouth, frequently become aphthous. Sometimes the tongue is of a dark red colour, resembling the lees of wine, occasionally as dark as logwood. This colour indicates the co-existence of congestion and plethora of the abdominal circulation. The bowels are constipated, but to this state diarrhœa is apt to succeed as the disease continues. The urine is high-coloured; the skin dry, harsh, and flaccid, except during sleep, or while digestion is in progress, when there are frequently heavy, partial, unsatisfactory sweats. The pulse is quick, hard, and small. In the evening and during sleep there is generally an exacerbation of all the symptoms, marked by agitation and restlessness.

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* Dolor inter pales tenens.--*Cœl. Aur.*

There is also a more chronic form of this complaint, which either arises more gradually, or into which the states we have just been describing may have subsided. It is marked by great uncertainty of appetite, sometimes impaired, sometimes morbidly increased, a sensation of heat at the pit of the stomach, sometimes likened to the feeling of a burning coal placed there, or there is a distressing sensation of craving, sinking, or indescribable anxiety. The patient is generally much tormented with flatulence, and the symptoms to which it gives rise, a sensation of choking, anxiety, restlessness, and hiccup; and he sometimes suffers much from pulsation at the præcordia, from spasmodic pains in the epigastric and left hypochondriac regions, or there may be a violent pain at the epigastrium extending through the left hypochondrium and left shoulder; frequently there is a sense of heat internally when the surface is cold, not inaptly termed by the common people an *inward fever*. All the symptoms are much increased by taking food, even the mildest, so much so that patients are afraid of taking food on account of the uneasiness produced by it, from a feeling as if the stomach were incapable of holding anything beyond the smallest quantity. When the stomach is empty, some patients are entirely free from complaint. The bowels are costive, the urine scanty and high-coloured; the tongue is moist and clean, but redder than natural, generally broken by sulci and studded with large developed papillæ; sometimes it is covered with a thin, milky, white fur, through which the papillæ project; the gums are often red, swollen, and spongy, and there is often a taste of salt, of alkali, or of blood in the mouth; sometimes the tongue presents a dry and glazed appearance, with insatiable thirst, and a dry parched state of the mouth; sometimes there is a raw and tender state of the mouth and throat, with uneasiness in swallowing; or there is a sense of burning in the mouth and throat, with hysterical constriction, pain and soreness in the course of the œsophagus. The pulse is small and feeble, and quicker than natural; the skin is dry, rough, shrivelled, flaccid, and sometimes at length almost scaly; the nails become dry and brittle, and often curved; the hair is parched, and inclined to stand on end, and the whole surface is cold. The patient is constantly hanging over the fire, and frequently experiences fits of chilliness, approaching to shivering. The feet and hands are either preternaturally hot or cold; there is coldness or a cold torpor of the extremities, with a general sensation of chilliness; extreme morbid sensibility of any change of temperature, so that when the patient gets warm in bed he soon becomes hot and oppressed, the soles of his feet and palms of his hands burn, and he tosses about restless until he breaks out into a strong and heavy sweat. His sleep is interrupted and unrefreshing, and he awakes hot, thirsty, and weary, in a state of confusion of mind.

The ordinary accompaniments of this chronic affection of the mucous membrane of the stomach are great languor and depression, sometimes insupportable, the patient sinking into a state of extreme debility on the least exertion. The body is wan and emaciated, frequently sallow, the temper fretful, anxious, impatient, or dejected; sometimes there is a troublesome cough, dry, or with scanty mucous sputa; or there is dyspnœa, and pain of the chest like pleurisy; and in either case the symptomatic febrile affection approaches so near to hectic, that it is not rarely mistaken for consumption; sometimes there is palpitation and other irregular actions of the heart; sometimes headach, a tense binding pain across the head, vertigo, or tinnitus aurium; sometimes neuralgic pains of the limbs, sometimes osteocopic or painful affections of the periosteum; and frequently some affection of the skin, chiefly *erysipelas*, *erythema*, *lichen*, *urticaria*, *pityriasis*, *psoriasis*, *alopæcia area*, the head becoming bald in round patches. But whatever be the most prominent secondary affections, the chief subject of the patient's complaint, there is a characteristic colouring common to every one of them,—they entirely engross his thoughts and occupy his attention, unless, which is not rarely the case, his bodily suffering be transformed into, and represented by, some mental hallucination. The patient's mind never turns from his sufferings, or if it does for an instant, it is only to revert to them with increased earnestness; and as the external senses constantly exercised acquire a fine and acute delicacy of sensation, so that they can take cognizance of minute and subtle objects which escape the ordinary sense, so the internal sense, painfully exercised in suffering which occupies his exclusive attention, acquires a keen microscopic power, and a fineness and subtilty of perception, which, surpassing common experience, is classed as partly nervous, partly imaginary, under the term of *hypochondriasis*,—a disease which M. Broussais satisfies himself with explaining as consisting in an excess of gastric susceptibility.

The change which takes place in the process of digestion is also a remarkable feature, which ought not to be omitted in the history of inflammatory dyspepsia. The food seldom runs into fermentation, acid or rancid eructations are rarely observed, and heartburn becomes comparatively ture; so that if the patient have previously suffered from atonic dyspepsia, he will observe that his heartburn has entirely left him. Certain kinds of food also are observed to be more easy of digestion, as farinaceous food, preparations of the fecula of vegetables, vegetable jellies, and mucilages, vegetable acids, and sweet diluents; the fat of meat, even the fat of bacon in moderate quantities, is more easily digested than lean, than animal jellies, than fibrous or albuminous substances, than eggs or milk.

The symptoms of inflammatory dyspepsia are invariably aggravated in spring, the period during which they are most severely felt being from the spring equinox to the summer solstice. They are also exasperated under the use of medicines of a stimulating quality, which can seldom be borne for more than a few days; and the same is observed of any strong purgative, which invariably gives rise to griping, irritation, and general exhaustion.

Causes.—Inflammatory dyspepsia is much influenced by age, sex, temperament, climate, and season. It is frequently met with in youth and early adolescence, but prevails most from the age of twenty to forty. It affects much more the male than the female sex, and chiefly the sanguine and bilious temperaments, people of a bright florid or of a dark complexion, but of a dry hard fibre. It is met with most frequently in hot and in dry climates, but more especially in those subject to an excessive range of temperature. It is frequent in windy situations, in places exposed to dry winds, whether they be hot or cold. European Turkey, Greece, Italy, Spain, and the south-eastern parts of France, are places which unite all the foregoing conditions, for which reason this disease is also endemic in these countries. The Venetian Friuli was the country in which this disease seems first to have arrested the attention of M. Broussais, a country placed pre-eminently in the foregoing predicament. The late Dr. Parry, of Bath, has taken notice of the prevalence on the sea-coast of the morbid condition of the mucous membranes on which this disease depends, an observation which we have had frequent occasion of confirming at Nice, Genoa, Marseilles, and at Brighton, which may account for the indispositions, in common language, the *bilious attacks*, which many persons experience on coming to the sea-side; but we are disposed to think that the sea-air is not the only condition, for we do not recollect to have met with it much on the coast of Devonshire, where we have had equal opportunities of observing it. We must, therefore, limit the observation to the sea-coast in dry climates. Spring, as has been already observed, has great influence in calling forth and in aggravating the complaint: it returns also with the approach of cold in October. It occurs, however, at all seasons, in extremely hot or extremely cold weather, during sharp or long-continued frosts, during the prevalence of dry winds, whether hot or cold; hence we find it to prevail in England during the north-east wind, in Provence during the *mistrale*, in Switzerland during the *bise*, and in Italy when the *tramontana* blows. It is met with in every rank of life, in the country as well as the city, in the outdoor peasant as well as in the artisan.

Certain states of body predispose to this disease,—as a state of general vascular plethora, a state of congestion of the abdominal circulation, suppression of the hemorrhoidal flux, suppression of the menstrual discharge, for which reason it is not uncommon in women at the critical term of life, to which we may add protracted atonic dyspepsia, the stomach becoming irritated by the habitual remora of crudities.[*]

But certain habits of life have the chief influence in inducing this complaint, such as living on dry, heating, and high-seasoned food, the habitual use of ardent spirits, of liqueurs, of punch, and of opium; hence it is the dyspepsia of the dram-drinker and opium-eater, and belongs altogether more to the drunkard than the glutton.

[Dr. Beaumont (*Experiments and Observations on the Gastric Juice*, &c. p. 240: Plattsburg, 1833,) found, in the case of the Canadian with the fistulous aperture into the stomach, that the free use of ardent spirits, wine, beer, or any intoxicating liquor, when continued for some days, invariably produced erythematic and aphthous patches in the villous lining of the stomach. He found, also, that eating voraciously, or to excess, swallowing food coarsely masticated, or too fast, almost invariably produced similar effects, if repeated a number of times in close succession. These morbid effects were seldom indicated by any ordinary symptoms or special sensations, and could not, in most cases, be anticipated; their existence was only ascertained by actual ocular observation.]

It may, however, independently of all predisposing circumstances, be at any time excited by certain accidental causes; as, for instance, by drinking cold liquids after violent exercise or fatigue, when the body has been cooled by perspiration, as frequently occurs in summer; by any unusual excess in diet or drink, more especially if the body is in a state of exhaustion; by any accidental indigestion, as from eating mushrooms, cucumbers, some kinds of shell-fish, nuts, and such-like; by change of diet, from a succulent refreshing to a dry heating diet,[†] as our French and German friends frequently experience on first coming to dwell amongst us; by a change of water from a soft to a hard calcareous water; by fatiguing and forced journeys; by night-watching; and hence it occurs frequently in nurses, or those fatigued by long attention upon sick friends or relatives; by grief, anxiety, sad or depressing passions, or by sudden bursts of passion; by change of air from a heavy dull atmosphere to a clear dry sky, and hence it is, in connection with the influence of sea-air, observed in a slight degree amongst our citizens during the first days of their visit to Brighton; by strong and stimulating medicines,[‡] thus we have known it to follow the use of cubebs and copaiba given for gonorrhœa, of Fowler's arsenical solution given for affections of the skin, of strong and irritating purgatives, stomachic medicines, tonic tinctures and elixirs, and irritating vomits, as mustard. It occurs frequently under a course of mercury, when the

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[*] *Magis* istam jugis indigestio parat.—*Cal. Aur*

[†] Ariditate et erethismo ventriculi a defectu potus aquosi.—*Sauvages.*

[‡] Medicaminis insueti potatio.—*Cal. Aur.*

constitutional action takes place quickly or runs high. It may also accompany catarrh, or be itself an effect of exposure to cold; it succeeds to the imperfect convalescence of gastric fevers, and supervenes on suppressed perspirations, and the repulsion of cutaneous eruptions.

Pathology.—That the form of dyspepsia we have just described proceeds immediately from vascular excitement of the mucous membrane of the stomach, it would be idle to set about proving. It would be superfluous to observe that no other hypothesis will account for the symptoms, or explain the operation of the causes of the disease, when the fact has been directly proved by innumerable dissections.

Whilst many of our predecessors have recognised and distinguished this particular form of disease, some of them have pointed out the morbid condition on which it depends. Thus, though Hippocrates has described it under a false name, he has yet set it apart as a particular form of repletion; whilst Celsus in its name has explained its nature—*stomachi ingens calor—ubi stomachus exæstuat.* The Methodists knew the disease under the term of *passio stomachica stricturæ*, and by their method of cure we may see that they also understood its nature. It was afterwards accurately described by Ætius under the term of *stomachi adstrictio*,* and may, indeed, be traced downwards under various appellations in the writings of every succeeding physician. In Italy the knowledge of the disease, its nature and its cure, have been handed down by traditional experience, and are now safely deposited in the hands of the vulgar, within the reach of every *baglia.* Not to cite unnecessary examples from modern physicians, Sauvages has, under several of his diseases of symptoms, described its form and indicated its nature, for his *anorexia biliosa vel canicularis*, his *cardialgia inflammatoria a veneno et sputatoria*, his *pyrosis a phlogosi et Suecica*, and his *gastrodynia adstringens*, not to mention several others, are only so many symptoms of this disease. Under the term *gastritis erythematica*, Cullen has recognised this disease, but the false principle of his nosology separated it from dyspepsia; and we can hardly recollect any instance in which false classification has been so detrimental to sound practice, or in which the influence of good and bad classification upon practice is more strikingly illustrated. From the time of Cullen to the time of Broussais, the symptoms of indigestion were considered purely a nervous disease, an adynamic affection, one of deficient vital power. For though Prost (Sur la Sensibilité) in France, and Parry in England, had, the one by dissections, the other inferentially, arrived at the conclusion that dyspepsia or disordered digestion might arise from an increased vascularity, a morbid fulness of the vessels of the villous coat of the stomach, it was unquestionably the author of the *Histoire des Phlegmasies Chroniques* who led us back to the right point of observation, and who afforded us the means of recognising and distinguishing these affections. His view of the matter has been amply confirmed by succeeding physicians, even by those who have arrived at his conclusions by a different path, by W. Philip, Andral, Louis, Abercrombie, Cooke, not to mention many more. It is probable, that, had Parry not fallen into the error which obscures the merit of Broussais—that of considering this morbid condition as exclusively the proximate cause of every form of dyspepsia—he might have had more influence on the sober minds of his countrymen.

The vascular excitement of the mucous membrane of the stomach occurs in various degrees of intensity, from a state of mere dryness or defective secretion of the membrane, of injection, congestion, or morbid fulness of the vessels, from a state of erethism or increased action, to actual inflammation. And dissection reveals to us that the inflammation of the mucous membrane of the stomach, and so probably the erethism of vascular excitement, which is not aggravated to inflammation, may present itself under three varieties; for it may affect the general substance of the mucous membrane, or it may be confined to the villosities which project from its surface, or the follicles which are embedded in it,—in all probability giving rise to diversities and modifications of the disease hereafter to be ascertained by closer and finer observation.

In the dyspepsia of the dram-drinker, marked by loss of appetite, by nausea and vomiting when the stomach is empty, and pain at the pit of the stomach, the stomach itself has often been found with a smooth glass-like surface internally, the extremities of the vessels in the villous membrane having been abraded or absorbed.

Inflammation of the mucous membrane of the stomach appears in many cases to commence in a very small and circumscribed portion; its progress seems to be very slow, and it is probable it may continue for a considerable time, and then subside, and again occur after various intervals, until at last it produces some permanent and extensive disease by thickening of the parietes of the stomach, by adhesion to the neighbouring parts, or by ulcerations.

Dr. Cullen observes, "Erythematic inflammations of the stomach are more frequent than those of the phlegmonic kind. It appears at least from dissections, that the stomach has often been affected with inflammation, when neither pain nor pyrexia had before given any notice of it; and such inflammation I apprehend to have been chiefly of the erythematic kind." "This affection of the stomach, viz., inflammation of the mucous membrane, sometimes spreads into the œsophagus, and appears in the pharynx, as well as on the whole internal surface of the mouth." "When, therefore," he continues, "an erythematic inflammation affects the mouth and fauces, and when at the same time there shall be in the stomach an unusual sensibility to acrids, with a frequent vomiting, there can be little doubt of the stomach being affected with the same inflammation that has appeared in the fauces. Even when no inflammation appears in the fauces, yet if some degree of pain be left in the stomach, if there be a want of appetite, an anxiety, frequent vomiting, or an unusual sensibility with regard to acrids, some thirst and frequency of pulse, there will be then more room to suspect an erythematic inflammation of the stomach; and we have known such symptoms discover their cause more clearly by the appearance of the inflammation of the fauces or mouth." "The erethymatic inflammation," he also observes, "is often disposed to spread from one place to another upon the same surface, and, in doing so, to leave the place it had first occupied. Thus such an inflammation has been known to spread superficially along the whole course of the alimentary canal, occasioning in the intestines diarrhœa, and in the stomach vomiting; the diarrhœa ceasing when the vomitings come on, or the vomitings upon the coming on of the diarrhœa." In the following passage Parry has made a corresponding observation. "In that state of tongue so common in the West Indies, in which the mucous membrane of that and the adjacent parts is affected with chronic inflammation, tending to aphthæ and suppuration, the stomach, apparently by mere extension of disease, suffers all the symptoms of flatus, acidity, &c. which are common to dyspepsia." Broussais has remarked that a contracted state of the stomach and alimentary canal always co-exists with an inflamed state of their mucous surfaces.

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* Molestia inter digerendum, cum alvo constipatâ, æstu generali maximè vero manuum ac pedum, faciei rubore, pulsu frequenti, aut juxta quosdam febricula; accidit temperamentis aridam et densam carnem habentibus.—Lib. iii. Ser. 1. cap. 13.

Inflammatory dyspepsia occurs frequently as a secondary as well as an idiopathic disease. Hence it appears as a symptom of some essential fevers, (In febribus circa ventriculum et fortis æstus et cordis morsus, malum—*Hipp.*) of variola and rubeola, (dyspepsia febrilis); it occurs in the last stage of phthisis pulmonalis, and in many organic diseases; it is frequently symptomatic of inflammation of the mucous membrane of the uterus, particularly that which follows retention of a part of the placenta; it is observed in plethora of the uterine system, and in plethora of the abdominal circulation (*dyspepsia hemorrhoidalis*); and is met with consecutive to extensive burns; and contemporary and reciprocally with erysipelas, erythema (*dyspepsia metastica*), and several cutaneous diseases; and we have several times found it co-existing with ichthyosis, and that dry impervious state which might be distinguished by the term of *constipation of the skin.*

Method of Cure.—I. Instead of exercise, as in the former species, we must here seek for repose of every description, (Omnifaria requies—*Cæl. Aur.*,) of mind as well as of body; but as some exercise is desirable for the general health, it must be of the easiest kind, such as gentle sauntering, walking, or the passive exercises of gestation in a carriage, sailing, swinging, rocking, and gentle friction. Instead of a dry diet, consisting chiefly of animal food, we shall find that a liquid diet, bland and farinaceous, small in quantity at a time, from which animal food and all indigestible substances are excluded, is the most to be recommended. The different articles of food comprehended under the saccharine, acidulous, mucilaginous, farinaceous, and feculent, are most easily digested in this morbid condition of the stomach, and therefore their opposite kinds, milk, eggs, cheese, fish, animal food, animal gelatine, the substantial, solid, or fibrous parts of vegetables, and fruits, are to be abstained from. After repose, or rather diminution of labour and exercise, and a refrigerant diet, suited in degree and kind to the particular state of the digestive organs, the warm bath may form part of the regimen. It should be used at a temperature from 92° to 96°, from a quarter to half an hour. If the symptoms require, it may be used every day; and it is of more benefit if used continuously, in a course of ten or twelve daily baths, than if taken interruptedly. Under this mode of administration, the tepid bath forms a direct remedy of great efficacy. But the general cure of this morbid condition of the stomach consists in a judicious use of the antiphlogistic regimen, graduated to the degree of the disease and the strength of the patient.

In the lowest degree of this complaint a change of diet, avoiding stimulating and heating food and drink, abstaining from active exercise, the use of a tepid bath, of some cooling acidulated drink, as lemonade, orangeade, imperial, orgeat, preserving the bowels open by a simple warm-water clyster, and, if necessary, any mild cooling aperient, for which purpose none answers better than manna dissolved in infusion of tamarinds, to which a small dose of some neutral salt may be added, afford all that is requisite for the cure.

In a higher degree of this complaint it may be necessary to have recourse to a regimen more rigidly abstemious, consisting of gruel, arrow-root, whey, sago, blanc-manges of rice, jelly of bread, of Iceland or Irish moss, solution of gum tragacanth, acidulated with lemon-juice, taken in small quantities at a time, in order to avoid distension; to prescribe largely acidulated saccharine drinks, as lemonade, cool, cold, or iced, or such bland drinks as orgeat, emulsions, decoction of liquorice, linseed-tea, &c.; to apply leeches or cupping-glasses freely to the epigastrium; (Cucurbita adjuncta scarifica tione, sive hirudinum appositio—*Cæl. Aur.*,) or, which is probably to be preferred, a moderate bleeding from the arm, proportionate to the degree of the disease: if there be signs of plethora or congestion of the abdominal circulation, leeches to the anus; to relieve the bowels by clysters or the mildest aperients, and to solicit the hepatic secretion by small doses of the pil. hydrarg. or pulv. hyd. cum cretâ given at bed-time, followed in the morning by small doses of castor-oil. The effects of mercurials must be assiduously watched; for in this disease they are apt to act locally on the mucous membrane, and thus affect the mouth, without, however, affecting the system at large. When mercurials are not used, the nitrate of potass may be given in repeated small doses; for this medicine, antimonials, castor-oil, hydrocyanic acid, the vegetable acids and saline medicines, are the means we are acquainted with which possess most eminently the direct power of lowering the vascular excitement of the stomach; and we do not hesitate sometimes to rely upon them in cases where venesection might otherwise be necessary. These means will be assisted, and their operation promoted by the use of fomentations, or emollient cataplasms to the abdomen, and by the daily use of the tepid bath. As the excitement subsides, the patient may gradually return to a better diet, beginning with light broths of veal or chicken, and at last, but more cautiously, solid food.

We are not unaware that the vascular excitement of the mucous membrane of one portion of the alimentary canal may be diminished by causing a determination to and a secretion from another part of it, and that thus the vascular excitement of the stomach may be reduced by a course of purging; but though this method may be frequently successful, it is not rarely prejudicial, sometimes dangerous.

In the chronic form of the complaint great nicety is required in adjusting the cooling treatment to the strength of the patient and the degree of the disease; for if the disease has been of long continuance, the nervous system is generally affected, and tolerates with difficulty the means suited to the relief of the local complaint; and if the depressing means be disproportionate to the degree of the disease, the stomach sinks into the opposite state, atonic dyspepsia supervenes, and the method of treatment is disparaged. This last consequence is more especially apt to occur if the inflammatory have succeeded to the atonic form of dyspepsia. It is on this account necessary to be cautious in the change of diet, and in the gradual withdrawal of stimulus. It may be advisable to continue in moderate quantities, the use of such animal food as is easy of digestion, as light beef-tea or veal-broth, in small quantities at a time, so as to avoid distention, and, by the bye, solid animal food; if not followed by thirst, increased heat, or headach, they are always useful. If the patient have been accustomed to stimulants, they must not be all at once, but gradually withdrawn; for it is an unquestionable fact that a highly morbidly sensitive state of the stomach may be developed, and even a certain degree of inflammation of its mucous membrane may be exasperated, by leaving off an habitual stimulus. The exhibition of medicines and of other directly depressing means must be modified by the same caution. Leeches will be less seldom necessary. Seltzer water, whey, two-milk whey, and goat's whey, may be used as substitutes for the acidulated drinks. The nitrate of potass may be made to be more easily tolerated by the stomach by mixing it with infusion of hop, chamomile, or quassia, to which, if no heat be present, a little tinct. cort. aurant. or tinct. card. comp. or spirit. æth. nitric. may be added. Dr. W. Philip observes that its alterative effect is not impaired by this addition. Or the hydrocyanic acid may be combined with these instead of the nitrate of potass, if there be any painful affection of the stomach. The vinum seminum colchici in very small doses has also to a certain degree the same effect. We have also observed that a water-ice eaten very slowly in the evening, instead of tea, is attended with very good effects; and in summer we have known great benefit derived from swallowing slowly and at intervals small pieces of solid ice when the stomach is empty, which, if the stomach can bear it, proves both a tonic and refrigerant.

With this plan of medical treatment much advantage may be derived from a diet well-timed and tempered, always varying it a little: as, for instance, animal food at first only on alternate days, afterwards on two succeeding days, and so on, but now and then interposing a day of abstinence. The same observation is also applicable to medicines · a certain change and variation of several is preferable to a long continuance of any one.

The bowels must be preserved open by the mildest and least irritating remedies. For this purpose clysters are to be preferred; they should consist of simple tepid water, from a pint to a quart, barley-water, gruel, linseed-tea, or such-like, or in smaller quantities with the addition of a little salt, honey, or electuary of senna; sometimes cold spring water is found to answer best. When aperients must be had recourse to, they should be bland and unirritating,—castor-oil, manna, soda with citric acid in effervescence, tartarised soda in infusion of tamarinds, confection of cassia or of senna. Ripe fruits eaten in the morning in considerable quantities have been found to have the effect of mild aperients, and to be at the same time refreshing to the stomach, such as ripe grapes, strawberries, and figs, which we believe to be the full meaning of the *cure des raisins* so much spoken of in Switzerland; but this method requires considerable caution, for if the fruit be not digested, the object is more than frustrated.

In the chronic state of the disease it is generally necessary to promote the secretions of the liver and alimentary canal by very small alterative doses of mild mercurial medicines. They afford valuable assistance to the general principle of treatment; but we must not forget the readiness with which they are apt to affect the mouth. Neither should the morbid condition of the skin which obtains in the chronic form of this disease be allowed to escape the attention of the physician in combining his method of treatment. He should seek not only to relieve its dry, impervious, constipated state by tepid bathing, particularly the tepid sea bath, but he will find it a means of relieving the vascular excitement of the stomach to produce a derivation to the surface by small doses of antimonials, either combined with a little liquor. acet. ammoniæ, or with the nitrate of potass, or by giving alone a grain of James's powder every night at bed-time, or the tenth of a grain of tartar emetic three times a day. If much irritability be present, the hyoscyamus is usefully combined with the antimonial. The following formula is well adapted to this intention:—℞ Tr. hyoscyam *m* xii. tr. opii *m* ii. vel iii. vini ipecac. *m* xx. potassæ nitratis gr. v. aq. flor. aurant. ℥i. fiat haustus h. s. sumendus. The determination to the skin may also in some cases be usefully promoted by the vapour-bath, and by moistening the skin every morning with a lotion of nitro-muriatic acid. The ancients appear to have had this object in view when they recommended the patient to be enveloped in woollen cloths impregnated with sulphur, and in directing friction to be made with nitre and oil.

But we must confess that in the protracted form of this complaint we have observed every object of this method of treatment fulfilled, and all medicinal means far surpassed in efficacy, by a course of mineral waters, such as those of Harrowgate at home, and those of Ems, Vichy, Plombieres, and Cauterêts abroad. To any of these, however, we should prefer the Kreutzbrunnen of Marienbad. Under its use we have often seen the tongue get cool, clean, smooth, and moist; the irritated papillæ subside; the uneasy sensations at the stomach give way; the skin become soft, smooth, and permeable; the bowels regular; and the healthy function of digestion entirely restored.

It should be taken gradually and in small quantities, in repeated doses of three ounces each. It may be taken warm or cold, as most agreeable to the stomach; if it produce distension, the gas should be allowed to escape; if spasm or diarrhœa, it may be diluted with the Kesselbrunnen of Ems.

The same effect is sometimes obtained from a course of goat's whey, taken in considerable quantities in the morning after the manner of a mineral water, a practice which is followed in Wales, and in the highlands of Scotland, but more particularly at Geiss in Switzerland, with the greatest success.

Neither in the acute nor the chronic form of this complaint does our experience lead us to place much confidence in counter-irritants, and we think we have not rarely seen the complaint exasperated under their use. But many physicians, whose opinions deserve the highest consideration, place considerable reliance upon them. They consist of blisters, the tartar emetic ointment, and issues. In the chronic form of the complaint we have certainly known great relief to attend the wearing a large warm plaster over the surface of the stomach, and in very protracted cases we consider it a good preservative from a relapse, from spasmodic pains, &c.

M. Broussais, having observed the frequency of this complaint in the south of Europe, has mentioned a change to a colder climate amongst his means of cure; but our own experience is in favour of a soft climate, if not too cold. In this complaint we have known one season in Devonshire of considerable benefit; on the continent, the climates of Pau in the south-west of France, Rome, and Pisa, are chiefly to be preferred. In the harsh, dry, impervious state of the skin, which takes place in the protracted state of this complaint, it is of great service to have an atmosphere and temperature soft, mild, and equable; and this consideration should also suggest the propriety of warm clothing, of rooms of equal temperature, and the occasional use of the tepid bath.

We think it unnecessary to enter into particular directions for mitigating or relieving the painful and distressing symptoms which are occasionally present in this disease, such as vomiting, pyrosis, gastrodynia, flatulence, and the various uneasy sensations felt in the region of the stomach. Their specific treatment is comprehended in the general method of cure; and for the secondary affections which originate in this morbid condition of the stomach, we can safely refer to the separate articles under which each of them will be considered as symptomatic diseases.

II. For the means of preventing the returning of this complaint, and correcting the predisposition of body on which it depends, we beg to refer to our plan of prevention in atonic gastric dyspepsia. With some modifications in the degree of the means suitable to the particular nature of this complaint, it will be found also to be of useful application here, after the morbid condition of the mucous membrane of the stomach has completely subsided.

III. Irritable Gastric Dyspepsia.

Synonyms.—Ἡ στομαχικὴ, *Aretæus; καρδιακὴ διάθεσις, Auct. Græc;* cardialgia sputatoria; pyrosis vulgaris et a conceptione; gastrodynia atterens, hysterica, periodynia, et a frigore; vomitus nephriticus et hystericus; anorexia melancholica; flatulentia hypochondrica, *Sauvag.;* anorexia ex desuetudine veneris, *Galen;* gastralgie, *French;* pain of stomach, most felt when it is full, *Pemberton.*

General Character.—Pain, uneasiness, uncomfortable or unnatural sensations in the stomach, generally increased on taking food, and during the process of digestion, neither the frequency of the pulse, nor the heat of the surface being at the same time sensibly increased; the pain rather relieved than increased by moderate pressure; appetite variable, seldom much impaired; bowels constipated; stools little altered; urine clear and sufficiently copious; micturition frequent; tongue clean or thinly furred, never thickly coated; temper impatient, restless, and changeable; easily dejected, easily excited; the attention constantly and exclusively fixed upon the uneasy sensations; great variableness in the degree and duration of all the symptoms.

Form of Disease.—In the slighter degree or earlier stage of this complaint, when the stomach is empty the patient is comparatively free from uneasiness, but on taking food or in the course of digestion various uncomfortable sensations are wont to arise. The patient may feel a sense of choking or constriction in the stomach, as if the progress of the food had been arrested; the throat feels dry, so that it requires an unusual effort to swallow each succeeding mouthful, and after the food has passed down he is disposed frequently to repeat the act of swallowing, as if to relieve the uneasy sensation; without thirst, he continues to sip small quantities of liquid from the same instinctive feeling, or the same sensation leads him to be constantly hawking and spitting, as if he had some foreign substance in the throat. This is sometimes accompanied with dull, indistinct, but anxious pains in the back, between the scapulæ, where the patient rubs or strikes himself, or requests some by-stander to hit the seat of the pain, hoping to be relieved thereby. In an aggravated degree the sensation in the stomach amounts to a severe constringing pain, and is attended with nausea, which, extending up the œsophagus, is met by a sensation of very painful constriction and stiffness of the lower jaw, chiefly in the situation of the parotid and submaxillary glands, followed by a copious discharge of a saltish saliva, which generally affords relief; or all these symptoms are relieved by vomiting, the food being returned very little changed in its appearance, though frequently an hour has expired from the time of taking it: these symptoms together constitute *pyrosis*. Or, instead of constriction, a sensation of heaving or nausea follows the taking of food, which is also occasionally terminated by vomiting. Sometimes it is a sensation of heat or burning, of coldness, sometimes of itching, tickling, or formication; sometimes there is pulsation at the epigastrium, in the hypochondria or abdomen, appearing suddenly, at first violent, and abating gradually, observed by Schmidtman (Summa Observationum medicarum ex Praxi clinica triginta annorum depromptarum. Berlin, 1826.) to be synchronous neither with the pulsation of the heart nor arteries, and occasionally changing place suddenly, even sometimes transferring itself to the extremities. These symptoms are usually accompanied by various degrees of general irritation, by a state of fidgetiness, or restlessness, inquietude, or anxiety. Sometimes the uneasiness is not perceived in, or referred to, the stomach, but is felt sympathetically in some other part of the body. Thus, the patient may complain of a sense of tension, of painful anxiety in the head, or of an acute pungent pain limited to one spot; or the heart may be the seat of similar affections accompanied with palpitation or irregular action, seldom with stronger impulse, with flushing of the face, or quickness of the pulse; or the patient may be seized with fits of loud coughing, with convulsive asthma, or spasmodic affections of the muscles of respiration; with cramp of the limbs, spasmodic pain in the uterus, bladder, or urethra; or neuralgic pain in some part of the body, in the uterus, testicles, or rectum; frequently a fit of hysteria, sometimes even symptoms of hysteria in men. Or the patients may feel restless or unquiet, or be seized with a fit of depression, of ungovernable impatience or anxiety. These symptoms generally terminate with digestion, but may be renewed by taking the mildest food. They are usually accompanied with coldness of the extremities, and early in the attack a discharge of pale limpid urine takes place. The tongue is seldom furred, more usually clean, or it is covered with a thin mucous fur, interrupted by fine waving transverse lines; under actual irritation it is dry without being accompanied by thirst; more generally there is a deficiency of saliva, but the tongue and lips are covered with a white frothy secretion which the patient is ever endeavouring to get rid of by spitting; sometimes it is moist, and the mouth is filled by an unusual flow of saliva; frequently the tongue is thinly furred, as if a fine white gauze were thrown over it; sometimes it is covered with a thin milky white fur, as if the patient had just been drinking milk, and sometimes it is besmeared with a thin frothy mucus. The tongue is generally rather paler than natural, but even when clean is never of a brighter red colour than in health. It is generally of a dull red, sometimes darker than natural. But the surface of the tongue, whether furred or not, presents the appearance of plush or velvet, which arises from the papillæ being fine and elongated, never either large, tuberous, and developed, or smooth and obliterated. The bowels are usually costive. The pulse is generally small, feeble, and soft, or small and contracted; it is seldom accelerated, more frequently slower than natural, except under some temporary excitement or agitation, when it is momentarily hurried or irregular. The skin is generally soft, rather glossy, but never dry, harsh, and scaly, as in inflammatory dyspepsia; it is permeable but seldom moist, except sometimes from a sudden breaking out of perspiration on particular parts of the body; perspiration is rather suppressed than obstructed.

In the more protracted forms of this complaint the stomach is rarely free from uneasiness or discomfort of one kind or another; the patient is never unconscious of sensations in the stomach, and to whatever object his attention may be directed, the uneasy feelings of the stomach are mingled in all his perceptions, tinge and darken all his thoughts, thus giving rise to another form of hypochondriasis. These sensations are sometimes that of burning heat, sometimes of icy cold, sometimes of gnawing, grinding, or dragging of the stomach, or of some foreign substance in the stomach, sometimes of emptiness or hollowness, of falling or sinking of the stomach, sometimes of nausea; or there is a constant sense of rising in the throat, sometimes of a round ball, sometimes of an insipid liquid. These uneasy feelings completely take away all power both of mind and body; the spirits become dejected, the body torpid, the limbs powerless,[*] the mind is prostrate, exclusively fixed upon the uneasy bodily sensation, or ever contemplating the gloomy association or the dark course of thoughts which they call forth;[†] and the sensibility of the stomach becomes consequently so highly exalted, that patients refer to it all their sensations, as is well expressed in a letter to Pinel from a lady, one of his patients: "Le principe de tous mes maux est dans mon ventre; il est tellement sensible, que peine, douleur, plaisir, en un mot toute éspèce d'affections morales, ont là leur principe. Un simple regard désobligeant me blesse cette partie si sensiblement, que toute la machine en est ébranlée. Je pense par le ventre, si je puis m'exprimer ainsi." Or there may be a feeling of anxiety, of restlessness, or impatience, which can neither be controlled nor overcome, with great nervous susceptibility; the mind is much impaired; the senses become delicate, the head giddy, the eye dazzled by the least effort of attention. Sometimes this morbid irritability is most apparent in the vascular system, the pulse being quickened, the heart made to palpitate, the face to flush with a sound of rushing or ringing in the ears. This peculiarity seems frequently to arise from excessive loss of blood. Urticaria, prurigo, stinging or itching of the skin, are not unusual attendants.

These symptoms are occasionally for a time relieved by taking food, and only return as the stomach becomes empty, which acquires a painfully irritable state as the period of taking food is delayed, but they are more commonly aggravated during the process of digestion; and sometimes, in a higher degree of gastric sensibility, severe pain is excited by swallowing the smallest morsel, which is on some occasions instantly rejected. In some cases liquids produce greater uneasiness than solids, and sometimes medicines are the greatest irritants. The symptoms are very much aggravated by purgatives; flatulence, violent palpitations, with a sensation of approaching syncope, and vertiginous feelings in the head, have been observed to arise upon the action of the mildest purgatives; sometimes violent diarrhœa follows the action of a moderate aperient. The pain and uneasy sensations at the stomach are frequently relieved, but sometimes inordinately increased by touch or pressure upon the epigastrium.

In this complaint there is great uncertainty or variableness of appetite; sometimes inappetency, even disgust for food, in its most aggravated form; frequently capriciousness, not rarely craving for food; remarkable antipathies and likings for particular kinds of food are frequently observed, and sometimes sudden fits of voraciousness, for such persons generally eat their meals very quickly. There is seldom thirst, but frequently a feeling of dryness in the throat and fauces. The bowels are universally confined, but the fæcal evacuation is little altered in quality. The urine is abundant and pale-coloured, and frequently occasions smarting in its passage, its specific gravity being considerable and the urea abundant. The sleep is variable, but seldom refreshing;* patients in this disease are easily put off their sleep; they either sleep heavily, or have difficulty in getting to sleep; if the mind be in the least degree excited or occupied, they pass a wakeful night, the mind being thrown into a state of erethism which they cannot quiet.

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[*] Ἄση, ἀκορίη, ὄψιες ἀμαυραὶ, ὤτων ἦχοι, βάρος κεφαλῆς, νάρκη μελέων, καὶ τὰ γυῖα λύονται. παλμὸς ἐν τοῖσι ὑποχονδρίοις.—*Aretæus.*

[†] Ἰσχνοὶ, ἔξωχροι, ἀσθενέες, ἔκλυτοι, λειποδρανέες, ἄψυχοι, δειλοὶ, ἡσύχιοι, ἐξαπίνης δ' ὀργίλοι, κάρτα μελαγχολώδεες.—*Aretæus.*

Complication of Irritable and Inflammatory Gastric Dyspepsia.—When irritable gastric dyspepsia has been of long continuance, when stimulating or irritating remedies have been used for its cure, either heating, stomachic, and anti-spasmodic medicines, or strong and irritating purgatives, or if the patient have been led by his uneasy sensations into the habit of taking small quantities of ardent spirits or opium, an inflammatory state of the mucous membranes is apt to be superadded to the morbid sensibility and irritability of the stomach, and thus is formed the most difficult and obstinate form of the disease with which a physician has to contend. The symptoms of both diseases are mixed up together, forming a combination very difficult to unravel, a difficulty much increased by the conflicting evidence which the *juvantia* and *lædentia* afford. The tongue affords the most distinct indication; it is red along its margin, frequently having round spots or points of a darker red interspersed; it is little furred, or has a brownish slimy fur; small ulcerations occur upon the tongue, as likewise upon the inside of the mouth. This appearance, united with symptoms of great nervous irritability, always indicates the combination of both morbid conditions.

Causes.—The circumstances capable of inducing irritable dyspepsia are, either such as act directly or locally upon the stomach, or such as influence the stomach indirectly by acting upon the general system; but the coincidence of causes belonging to both these classes, has the most powerful influence in determining irritable gastric dyspepsia.

To the first description belong the habitual remora of crudities in the stomach, and therefore, in certain temperaments and under the modifying influence of more general causes, irritable not rarely succeeds to atonic dyspepsia; living upon hard, poor, and indigestible kinds of food, not suited to the nature of the body. From this cause proceeds the dyspepsia which afflicts the Irish poor, a great portion of whom live entirely on the potatoe, without milk, butter, or any kind of condiment; and many of the peasants of Scotland, highland and lowland, too strictly confined to the oaten bread; which accounts for the prevalence of pyrosis in these countries; and to a deficiency of quantity and an unnatural quality of food is no doubt owing much of the dyspepsia of the poor in large cities, where it has been known that families have subsisted for a time on the rind of potatoes, and every description of poor and loathsome food;† men in the centre of civilization experiencing all the uncertainty of subsistence which belongs to savage life, without the habits which give them strength to sustain it. Other causes are, change from a stimulating, nutritious diet, to one of a poor, cold nature; leaving off any accustomed stimulus, as opium; a certain tenderness (teneritudo), delicacy, or partial irritability of the stomach, sometimes inherited, but also the consequence of over care and restriction in the choice of food;‡ abstinence and prolonged fasts: hence dyspepsia is a frequent consequence of the strict observance of the Catholic fasts, and hence Pinel numbers among the causes of dyspepsia the abstinence of the Bramins, of the Fakirs, and the ancient anchorites of the Thebaid. Certain acrid and irritating ingesta, as the habitual use of mercurial preparations, sometimes irritating purgatives, very strong green tea, and such like.

The causes of the second description are a delicate, irritable, nervous temperament, hereditary or acquired; irritability of mind, usually the consequence of moral causes, as of anxiety, vexation, envy, jealousy, nostalgia, contrarieties, reverses of fortune, over-indulgence in tender feelings, nourishing a delicate sensibility, and avoiding too carefully the ordinary rubs of life. Baglivi says, "*Patres familiaris et rei familiaris curâ distenti aut in dignitate fuerint constituti, aut in aulâ vivant.*" He might also have added the mothers of families, for we are not acquainted with a more general cause of this disease than the anxieties of mothers watching over the health and education of their children, their own health at the same time being frequently undermined by diseases peculiar to their sex. We may add causes which disturb, extremely exhaust, or debilitate the body, as concussion of the brain, repeated venesections inopportunely employed; protracted and exhausting hemorrhages, weakening discharges; all which causes are more powerfully felt if the stomach be irritated by indigestible food or exciting physic; climates and season of year, frequent and sudden variations of temperature, to which probably may be attributed the colic of Madrid, nearly related to this disease, and also the prevalence of this disease in the spring in our own country.

The morbid irritability of the stomach may be also sympathetically induced from its consent with other organs. This affords a common source of the disease in the female sex, in whom it is often induced by an irritable or painful state of the womb, as occurs in dysmenorrhœa, in some forms of menorrhagia, in leucorrhœa, pregnancy, lactation, and hysteria. But the same effects may follow an irritable or painful performance of the function of other organs, as is exemplified in a painful state of the kidneys and ureters, in stricture of the urethra, in an irritable state of the testicles, and in other painful local complaints.

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* Οὐχ ὕπνῳ ἀτρεκέϊ.—*Aretæus.*

† *Ξυνῆθες δὲ καὶ τοῖς ὑπό τε ἀνάγκαις ἐκδεδιῃτημένοις λεπτῇ καὶ σκληροτέρῃ διαίτῃ.—Aretæus.*

‡ Multi ceteroquin sani et robusti parcè atque timidè cibum sumunt ob metum ne in cruditatem et exinde morbos delabunt cum ob illum ipsum timorem et vanam imaginationem non solùm exiguum illum bibum malè digerunt sed ob hoc in morbos incidunt.—*Baglivi.*

Pathology. — Though the ancients did not generalize the phenomena of this disease under any specific term, they have most accurately described them. Hippocrates has detailed the symptoms in his account of that state of body in which the fatigue exceeds the suppport,—*οἱ πόνοι κρατέουτι των σίτων*, and we doubt much whether a more faithful portrait of it is to be found than that left us by Aretæus of his disease—*στομαχική*. The Methodists would seem to have known it under the term *durities stomachi*, a sub-species of their *passio stomachica stricturæ*. It was very fully described and treated of by Cheyne, was noticed by Tissot, Pomme, and other writers, but most especially by Whytt, who was himself a sufferer from it. The nature of it was very clearly pointed out by Pemberton under the term of "*pain of the stomach increased upon taking food*," as will appear from his own explanation. "The pain of the stomach, which is most felt when it is full, would appear to arise from irritability of the muscular coat of that organ, and not to be at all connected with the glandular secretions of it; for unless the pain be called forth by taking food, it will rest perfectly at ease. This disease seems particularly to attack chlorotic women and hypochondriacal men; I am, therefore, inclined to believe that it owes its origin to the muscular fibres of the stomach partaking of the general irritability of all muscular parts in an irritable habit; and I think that the advantage derived from the method of treatment hereafter mentioned will add considerable strength to this opinion." In Germany it was very accurately treated of by Schmidtman under the name of one of its symptoms, *cardialgia*, (op. cit.) by which is understood any pain or uneasiness of the stomach, not heartburn, as it is usually translated; in France by Louyer Villermay under that of hypochondriasis, which he considers to depend upon some modification of the organic sensibility of the abdominal viscera, especially of the stomach; and was, lastly, more fully developed by Barras, (Traité sur les gastralgies de Paris, 1827,) he himself having experienced the disease to a deplorable degree. We are indebted to Dr. James Johnson for having recalled the attention of the profession in England to this disease in his able work on the morbid sensibility of the stomach.

They who are practically conversant with the sufferings of the human body, are too well aware that it does, under certain circumstances, assume a morbid condition which supports with difficulty the impressions of all external agents, even the most ordinary, whether their property be to excite, to depress, or otherwise modify the vital powers. This state of body perceives impressions, in kind and degree, not cognizable in the healthy state of sensation, and is excited to action by slight causes, which in the ordinary state of health would have no effect. Persons labouring under this affection are disturbed beyond all measure by the weakest stimulants, and are overwhelmed by a sedative of the lowest powers. In such persons we have known a few grains of nitre to cause fainting, or a severe fit of colic, the loss of a trifling quantity of blood to induce a convulsion, a Plummer's pill to bring on deadly cold sweats, inexpressible agony, and all the threatening symptoms of instant death, a few drops of laudanum to induce convulsive fits and delirium. The phenomena of this morbid state of body have been generalized under the term *irritability*, consisting, as is evident, not only in a morbid sensibility, but also in a morbid susceptibility, or mobility, in some respects the reverse of that of atony, in which both the sensibility and mobility of the body are remarkably diminished, sometimes requiring the most powerful stimulus to call them into action; but both appear in some measure to be connected with a state of deficient vital power, from the manner in which they are aggravated, if not produced, by debility and debilitating causes. In this respect, perhaps, their common nature might be acknowledged, whilst their particular character was distinguished, and thus atony might be termed passive debility, debility in repose, — irritability, active debility, debility in action.

This constitution of body may be hereditary or it may be acquired, but the manner in which it is engendered, though well deserving of investigation, has not yet been satisfactorily explained. It seems, however, capable of being produced in the strongest bodies by painful suffering or long-continued strain of body or mind. A painfully sensitive state of any part of the body, permanent or frequently recurring, by which as it were the nervous system is sustained in a constant state of erethism or wakefulness, and by which a second or morbid sensorium becomes by degrees developed, where every sensation is felt or reflected, seems to have the power of inducing this condition of body. The tic douloureux, calculus of the kidneys or bladder, stricture of the urethra, painful menstruation, chronic rheumatism, prurigo, even such insignificant ailments as tooth-ach or painful corns, afford every-day examples of this power. Painful gestation, difficult parturition, afford similar examples, but sometimes rendered more remarkably striking when combined with debilitating causes, as they frequently are, particularly by excessive losses of blood, as in flooding after miscarriages or lying-in. But, debilitating causes without pain have much less power in inducing this state of body. The most complete anæmia may sometimes be observed without irritability, and we fancy it will be found that the debility has been in the one case induced with pain, and in the other without it. Pain, however, supervening upon a state of debility, affords the combination of circumstances the most powerful in inducing irritability.

In the same manner the affections of the mind most capable of inducing this state of body, are long-continued care and anxiety, expectations deferred, and repeated disappointments, all the feelings usually comprehended under the term vexation, the effects of which, if examined into, will be found to consist in a state of painful consciousness, exactly corresponding to the state of the body just described, both agreeing in exciting a constant and continued state of nervous erethism, and in developing a new seat of sensorial power, distinct from that of the common sensorium.

This view of the manner in which irritability is acquired, is amply borne out by the nature of the operation of the causes which are capable of exciting it, whether general or local, to both of which we must refer.

According to the operation of these two kinds of causes, this morbid condition may be general, affecting every organ of the body, or it may be local, confining itself to some particular system or to some particular organ. It may commence in some particular organ, and thence propagate itself to the general system, or it may, emanating from the general system, diffuse its influence over the whole body, or, from certain local causes, be concentrated upon particular organs. Instances of the former are afforded by the eye, which sometimes acquires a morbid degree of irritability out of all proportion to the general state. The same may be observed of the womb in painful menstruation, or after frequent miscarriages; of the bladder, which sometimes, without any inflammation, acquires a degree of irritability, rendering it incapable of retaining the smallest quantity of urine; of the urethra, giving rise to painful and spasmodic stricture; and the testes and kidneys, equally susceptible of this state, afford similar examples. The heart and vascular system appear also, from the influence of particular causes, to be sometimes placed exclusively under the influence of this state, as is shown by the quick, irregular, and easily excitable pulse, the palpitation and disturbed action of the heart, the sudden flushing sometimes of the whole surface, sometimes confined to a small extent. It is not, therefore, to be doubted that the stomach and bowels may be affected in the same manner, and placed in the same morbid condition, consequently giving rise to a corresponding form of dyspepsia.

Nor is it difficult to understand either, how from local causes this state of morbid irritability should be engendered in the stomach, or how any disorder of the digestive function, when the constitution or any particular organ is under the influence of this state of irritability, should, by virtue of the law of consent, assume the form of disease.

When from any cause, as from habitual indigestion, the stomach is kept continually in a state of irritation or erethism by the remora of crudities, it becomes a seat of conscious sensation, to which the attention is continually directed. In consequence of which, as we have already explained, the stomach acquires an acute degree of sensibility like any other sense long exercised under the constant effort of the attention. To use the words of M. Barras, "la sensibilité de l'estomac s'exalte à un point étonnant; d'organique elle devient animale, pour me servir du language de Bichât. Tout ce qui se passoit dans le principal organe de la digestion, je le sentois comme s'il se fut passé sur l'organe du tact, la presence des alimens y étoit perçu, comme elle auroit été sur la main." That such is the effect of the remora of crudities we have a strong proof in the parallel case where foreign bodies are lodged in the stomach, (Gastrodynia à peregrinis,) or generated there, as in the case of bezoartic concretions, (Gastrodynia Calculosa, vomitus Bezoarticus, *Sauvages*,) or parasitic animals. (Dyspepsia verminosa, Cardialgia verminosa, vomitus verminosus, nausea à taeniâ.—*Id.*) In all these cases the same morbid irritability is developed, giving rise to all the peculiar symptoms which belong to irritable gastric dyspepsia. The following case affords a good illustration. "A man of sixty years of age had for a long time experienced, whenever he took a little nourishment, violent cramps of the stomach, accompanied with a sensation of heat in that organ, and with the eructation of liquid so acrid that it ulcerated the pharynx and corroded the enamel of the teeth; to these symptoms were added vomiting, which returned several times in the day, a continual sensation of pressure and of agony at the præcordial region, disgust for food, habitual constipation, almost entire loss of sleep, and at last gradual wasting. One day, in one of his usual efforts of vomiting, a calculus was ejected, which afforded the patient some relief, and the day after a return of the vomiting effected the expulsion of a second. The first of these calculi weighed a drachm, the second half a drachm. A short time after these were ejected, the patient was restored to health." (*Andral*, Anat. Path. p. 168.) Similar cases with corresponding results are also to be met with from organic causes, as, for instance, when tumours, fungous, vegetative productions have been found projecting into the stomach, they have been always preceded by the symptoms of irritable dyspepsia; ulcers of the mucous membrane of the stomach, and diminished capacity of this organ, have also been known to give rise to similar symptoms. And to this manner of operation may also be referred all the other local causes of irritable dyspepsia.

Of the secondary origin of irritable gastric dyspepsia, where the disorder of digestion emanates from, or is modified by the irritable state of the constitution, or of some other organ, we have examples of the former kind in concussion of the brain, in nostalgia, in the *cardialgia lactantium*, *anorexia*, *cachectorum*, and *anorexia melancholica* of Sauvages; in the *anorexia exhaustorum*, *dyspepsia cachectica* of Cullen; and of the latter, in the *nausea nephritica*, *vomitus nephriticus*, in the *gastrodynia hysterica* and *chlorotica*, the nausea and *vomitus gravidarum*, the *pyrosis a conceptione*, of Sauvages; and in the *dyspepsia nephritica*, *hysterica*, *catamenialis*, *dysmenorrhœaca*, *gravidarum*, *chlorotica*, and *hypochondriaca*, of Cullen.

We must also notice in this place a form of secondary dyspepsia arising from spinal irritation, which has been particularly described by Mr. Teale, of Leeds, in his very able and practical work on neuralgia. There can be no doubt that every species of dyspepsia may originate in a morbid state of the spinal marrow; but according to this writer the spinal irritation will be always perceptible on pressing some of the middle or lower dorsal vertebræ, or by tenderness in the neighbourhood of the middle and lower thoracic ganglia. This affords the chief distinction of this variety of dyspepsia, which, with the other secondary forms of dyspepsia, only derives permanent relief by the treatment of the primary disease.

Treatment.—The method of cure which experience sanctions is in exact correspondence with the pathological explanation which we have given of the disease. It consists of the following indications—viz. 1, endeavouring to render the function of digestion easy of performance by a selection of food suited to the nature of the disease; 2, correcting the morbid condition of the stomach, either *directly*, by the use of medicines which have the power of modifying its innervation, of diminishing its morbid sensibility and irritability; or *indirectly*, by such means as soothe and assuage the irritability of the whole body; and 3, by restoring the tone of the stomach and of the whole system, by which the morbid condition is not only removed, but its return prevented.

1. The first indication will be fulfilled by a proper regulation of the diet, suited to the sensibility of the stomach, and apportioned to the wants of the body, adjusting it to the exercise of the body and the occupation of the mind.

It may be collected from what has been said, that the waste outruns the supply, that the wear and tear of the body and mind exceeds the ratio of supply; but it would be in vain to think of restoring the equilibrium by increasing the quality or quantity of the nourishment, for the stomach could neither bear it nor appropriate it. It is therefore to be adjusted by diminishing the fatigue of body or the wear of the mind, as either may be the offending habit.

The chief object to be held in view in selecting the diet, is, that it should be of such a nature and in such a quantity as may be digested with the least labour and the least irritation, and such as leaves no indigestible refuse to gall and fret the stomach, thus keeping its sensibility ever awake. What answers this purpose best is a mixed diet, what Cheyne was used to call a *trimming diet*. It consists partly of animal and partly of farinaceous food, neither entirely dry nor entirely fluid or pultaceous, avoiding all those kinds which have been already specified under the treatment of atonic gastric dyspepsia, as universally indigestible. The quantity is also of paramount importance. The meals, of whatever they consist, ought to be very small, but may in proportion be more frequently repeated, it being of the first importance to avoid distension of the stomach. Some of the most aggravated forms of this complaint appear to have been cured by carrying this principle to its full extent. The cases related by Dr. William Hunter (Medical Observations and Inquiries, vol. vi.) and by Mr. Hey of Leeds were cured by feeding the patients on skimmed milk, given in very minute quantities, one or two table-spoonfuls at a time; and another similar case (*Abercrombie*, Diseases of the Abdomen, p. 51,) was treated successfully by Dr. Barlow of Bath, by restricting his patient to a diet consisting wholly of fresh-made uncompressed curd, of which she took only one table-spoonful at a time, repeating it as often as she found it advisable. And we have known a similar case in which a preparation of the fecula of oats, known in Scotland by the name of *sowens*, in Ireland by that of *flummery*, given in repeated small quantities, proved equally efficacious: milk has been also used in the same way. Such a plan of diet refers, of course, to extreme cases. We have only mentioned these instances for the sake of impressing the importance of small meals. We have found the strictly dry diet invariably difficult of digestion, and would in general recommend to begin dinner by a few spoonfuls of light plain refreshing soup. A very small quantity of properly dressed tender vegetables is admissible. One glass of sherry, or two of claret, Sauterne, hermitage, or hock, or a proportional quantity of brandy and water, may be permitted, or these may be taken alternately with a small quantity of home-brewed beer. The temperature of the diet has also been found of very great consequence. It has sometimes been found that the food eaten perfectly cold has digested easily, when the hot has been immediately rejected, though the reverse is generally the case. It is of the greatest importance in every form of dyspepsia, but most especially in this, to eat deliberately, and to masticate the food with scrupulous care.

Procuring easy and satisfactory relief of the bowels is another means of indirectly relieving the irritability of the stomach. This object ought to be attained by the mildest means, for purgatives frequently disagree, and the milder purgatives act better than the rough or violent ones. When the simple clyster will effect this purpose, it is to be preferred: if not, some mild aloetic pill, similar to the formula already given, or the decoct. aloes comp. are the most suitable. It is sometimes of service to combine the extract of hyoscyamus, sometimes a minute quantity of opium, sometimes the sulphate of quina, and sometimes bismuth or steel, with the aperient.

Fatigue of body is sedulously to be avoided, and when the condition of life imposes labour, it is to be lightened as much as possible. Even for those with whom labour is voluntary, much exercise in this disease is not found advantageous, though dwelling as much as possible in the open air is always to be desired. The exercise should be easy, sauntering, soothing, and amusing, as slow moderate walking upon plain ground, exercise on horseback, or an easy-paced pony, driving in an easy open carriage, boat-sailing, or a sea voyage, if the season permit. Some light amusing game may be added to the exercise, as golf.

2. Some medicines have the power of acting directly upon the nerves of the stomach, and in that way of diminishing their irritability. One of the most powerful of these is the hydrocyanic acid, either as it is prepared, or as it is found in the distilled laurel-water. The same power is also possessed by the extract of belladonna, and the nux vomica is used by the peasants of Lapland for their endemic pyrosis. The subnitrate of bismuth, the sulphate of iron, the arsenical solution, and the nitrate of silver, are also remedies of the same nature, and have been attended sometimes with surprising effects. Camphor, valerian, and the fetid gums, are similar remedies of weaker powers. Their preparations, however, afford useful media for the exhibition of the more powerful medicines. If these medicines do not soon afford some mitigation of the symptoms, they ought to be discontinued. Alkali or alkaline mineral waters have considerable power in soothing the irritation of the stomach, as the liquor potassæ or lime-water, but most especially the Kesselbrunnen of Ems, the Theresienbrunnen of Carlsbad, and the waters of Vichy.

Counter-irritants applied to the epigastrium in obstinate cases have seemed to afford relief, but more permanent benefit has appeared to us to follow the continued use of a warm emollient opiate or Burgundy plaster. The warm douche upon the stomach, as used at the baths of Lucca and at other thermal springs, we have known to be of considerable use in this way.

Relaxation and repose of mind prove frequently of themselves a cure for this complaint, by which the disturbed functions recover themselves; and to a certain degree they are essential to the success of the general plan of treatment. Though we may not have the power of throwing off the burden as we will, much is to be effected by disposing the mind to it. By a gentle steady effort it may be subdued to a state, if not of ease, certainly of quietude. They who know how to appreciate health will not hesitate to make any sacrifice, and they who cannot or will not make the sacrifice, may still do much to correct their habits. If they cannot have entire relaxation, they may seek to change or interrupt their occupations: "Levat quoque lassitudinem etiam laboris mutatio." And if they cannot conquer the habit which care and anxiety have established, they may obtain much by seducing the mind into other occupations.* "It is upon this account," says Cheyne, "that I would earnestly recommend to all those afflicted with nervous distempers, always to have some innocent entertaining amusement to employ themselves in for the rest of the day, after they have employed a sufficient time upon exercise, towards the evening, to prepare themselves for the night's rest. It seems to be absolutely impossible, without such help, to keep the mind easy and prevent its wearing out the body as the sword does the scabbard; it is no matter what it is, provided it be but a *hobby-horse*, and an amusement to stop the current of reflection and intense thinking, which persons of weak nerves are apt to run into. The common division of mankind into *quick thinkers*, *slow thinkers*, and *no thinkers*, is not without foundation in nature and philosophy. Intervals of no thinking or Swiss meditation are necessary for health." Under this impression it has often occurred to us that the innocent pastimes of life are very much undervalued, and we have not hesitated to recommend our patients their quiet rubber of whist, a party at piquet, a game at draughts or backgammon, even chess, or any thing by which the mind is amused without being excited; light occupations of the mind which divert the attention without occupying or fatiguing it; light reading, arithmetical calculations, any game where the stake excites no interest: music (*flute-playing*), drawing, embroidery, and every description of handywork. We have also known the greatest advantage derived from practising some of the mechanical arts; one of the most inveterate cases of irritable dyspepsia we have known was very much alleviated by the patient taking to the employment of turning.

But frequently all these objects are most completely attained by a tour, a sea voyage, a change of air, which, including change of food, of exercise, occupation, and habits, invigorates the body whilst it relaxes the mind.

The general irritability of the body is much diminished by an open dry air, and by dwelling in it as much as possible; by a long sea voyage, in severe cases, by the use of the rocking-chair, the rocking-sofa, and by the swing. But the restoration of no function tends so effectually to calm the irritation and repress the jaded fibres of the body as sleep, and we are of opinion that this, which is left to return as an effect of the general improvement, might probably be advantageously solicited and sought for, as a means as well as a consequence of recovery, if possible, by the more natural means, by gentle exercise in the open air, by early hours, by tepid baths, proportioned in duration to the strength of the patient, the warm pediluvium; but if these are not successful, by anodynes, by the acetate or muriate of morphia, or the black drop, judiciously managed, so as not to derange the function of digestion. This object is so important that it is often desirable to give up an hour or two in the middle of the day to sleep. If the tepid bath does not produce headach or sleeplesaness, it is always of service; but to the extreme cases of the disease, where the patient's strength is much exhausted, it is not applicable.

The temperature of the body is to be supported by warm clothing; a flannel roller is of great use; and medicines determining to the skin often afford relief, as ipecacuanha or James's powder in small doses, combined with extract of hyoscyamus. The tone of the body will be invigorated, and the morbid irritability directly diminished, by dwelling much in the open air in a dry temperate atmosphere. We are convinced that, besides the influence of change of habit, this is one of the most important effects of passing a winter in the south of Europe. This effect we have known many persons feel most sensibly, saying they felt as if their nerves were loosened and set free—as if they were out of fetters. When the patient's sensibility is not too delicate, the daily cold ablution is of great service; and in a higher degree of strength the shower-bath may be used with advantage.

3. Provided the bowels are properly regulated, and the function of the liver correctly performed, some tonic medicines may be had recourse to; but if the preceding plan be faithfully executed, their use will be found of secondary importance. Whatever quiets and strengthens is expedient in irritable dyspepsia, and tonics and stimulants often appear to possess a specific effect in subduing irritable action of the nervous system. They consist of the sulphate of quina, which some have administered endermically; steel in its various preparations. Pemberton was in the habit of giving Griffith's green draught. The ferrum ammoniatum is a convenient form, or the vinum ferri. The carbonated chalybeate waters are frequently successful when no officinal preparation of iron can be borne, chiefly those of Eger, Spa, and Pyrmont. The irritability is also sometimes diminished by a judicious use of stimulants, but it is a practice which demands much judgment and discretion.

The secondary forms of this disease must be treated by a proper consideration of the primary disorder in which they originate; and for the cure of the secondary affections which originate in irritable dyspepsia, we must refer to the separate articles to which they belong. In conclusion we cannot better explain our notion of the principle which ought to preside over the treatment of this disease in all its forms than by quoting the words of Baglivi: "Blandè et leniter tractandi sunt; a nimiâ remediorum copiâ et vehementia quam maximè abstinendum."

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* Vita namque tamdiu in perturbatione est, remedia nequicquam proficiunt, et licet ea recipiat, viribus tamen illorum non auscultat.—*Baglivi.*

IV.—Follicular Gastric Dyspepsia.

Synonyms.—Stomachi pituita, *Cels.*; rheumatismus vel fluor stomachi, *Cæl. Aur.*; cardilœa, *Plateri*; anorexia pituitosa, vomitus pituitosus, cardialgia bradypeta, *Sauvag.*; anorexia humoralis, *Cullen*; catarrhe de l'estomac, *Pinel*; estomac glaireuse,* *Fr.*: pain of the stomach, most felt when the stomach is empty, *Pemberton.*

General Character.—Pain, nausea, cramp, sensation of gnawing, of weight, or other uneasiness in the stomach, chiefly felt in the morning or when the stomach is empty, and frequently followed by vomiting of an insipid, viscid, sub-pellucid fluid.†

Form of Disease.—This species of dyspepsia is chiefly met with in crapulous old people, and in young persons of a cold phlegmatic temperament about the age of puberty. It prevails most in cold and damp climates, and in cold and damp seasons; it is the usual attendant of the winter cough of old age, and frequently supervenes in the course or upon the decline of a catarrh, and is usually relieved in summer and aggravated in winter. It is commonly manifested by pain, a sense of weight, of gnawing, sometimes by craving, or by obtuse spasmodic pain, or other uneasiness, when the stomach is empty; by loss of appetite, nausea, and sometimes by vomiting of a transparent ropy tasteless fluid, clear and glairy like the white of an egg, more generally in the morning, but sometimes towards night. The nausea and other uneasy sensations of the stomach are usually very much relieved by the rejection of this fluid, the quantity of which is in some cases very considerable. In a woman mentioned by Andral, this discharge amounted to about four pints in the twenty-four hours; and, what is remarkable, she never vomited either food or drink, showing this fluid to be highly offensive, and a source of irritation to the stomach. (Clinique Medicale.) The pain and uneasy feelings of the stomach sometimes assume the form of *pyrosis*, accompanied with a copious flow of saliva, or a continual watering of the mouth, corresponding with nausea, or a sensation of gnawing at the stomach.‡ Besides these more specific symptoms, this disease is attended by those which are common to the other forms of dyspepsia, by flatulence, by eructations of flatus or fluid, generally insipid, sometimes slightly acid; by oppression at the stomach after eating, although the pain and uneasiness are considerably diminished by taking food. There is a frequent desire to take food, attended with thirst, and as the disease continues, there is also considerable wasting of the flesh. The uneasiness produced by laborious digestion subsides as the process is finished, but before the time of taking food arrives, the stomach becomes irritated by its own secretion, which produces all the inconvenience of a foreign indigestible substance in that organ, such as a sense of sinking, of dragging or trembling of the stomach, of nausea, faintness, gnawing or erosion, which are again for a time relieved by the taking of food.§

The distension of the stomach by flatus sometimes gives rise to great oppression or anxiety at the stomach, to the same sensation in the breast, and to vertigo and other uneasy feeling in the head, to palpitation or irregular action of the heart trembling of the knees, and coldness of the feet and legs. These symptoms are generally relieved as the flatus is expelled, which is, however, accomplished with more difficulty in the recumbent posture; if not accomplished, restlessness, agitation, requiring a constant change of posture, frightful dreams, or incubus, are common attendants.

In this form of dyspepsia there is generally some thirst; the tongue is covered with a viscid mucus; sometimes the papillæ only are tipped with a dull white fur, but frequently it presents a continuous white fur and a sodden appearance; under irritation the tongue becomes dry, presenting a shining or glossy appearance, but still continues paler than natural. The bowels are generally confined, and the evacuations scanty; sometimes large quantities of mucus, generally fluid, sometimes concrete, are mixed with them. The urine is usually high-coloured, seldom sedimentous. Unless there be great debility, the pulse is slow and soft, and the extremities are generally cold.

The sympathetic affections which characterize this form of dyspepsia are, a troublesome cough, with considerable mucous expectoration, which is much increased by taking food, dyspnœa, humoral asthma, and leucorrhœa. It has also appeared to us that *acne*, in some of its forms, is a disease of the skin very frequently connected with this particular derangement of the digestion; and we have had occasion to notice a form of rheumatism, accompanied by palsy of the parts affected, which frequently attends it,—that species which has from some physicians received the name of *paraplexia rheumatica*. Sympathetic headach is less common.

Causes.—The predisposing causes of this disease are a, phlegmatic temperament, natural or acquired; the decline of life, that period after the forty-fifth year, the *senium crudum*, green old age, *l'age de rétour* of the French; the latter part of childhood, the period bordering upon puberty, before and after; damp climates, damp seasons, and damp weather; low marshy situations; indolence of body and mind, and sedentary habits. The ancients thought that particular kinds of food, also, favoured this predisposition. "Crassiorem autem pituitam faciunt ova sorbilia, alica, oryza, amylum, ptysana, lac, bulbi, omniaque ferè glutinosa."—(*Celsus.*) Some physicians have also considered it to be more common in great ale drinkers and smokers.

The exciting causes are accidental indigestions from food of an improper quality, and catarrhal colds.

This disease may succeed to atonic as well as inflammatory dyspepsia, probably presenting in each case a corresponding variety, a circumstance which leads us to doubt whether we are perfectly correct in erecting this form of dyspepsia into a distinct species, and whether it might not have been more so, to have arranged each of their varieties as sub-species respectively of atonic and inflammatory dyspepsia. But not having been able to distinguish these varieties by their proper symptoms, we must leave the task to a better method and a more refining analysis.

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* *Doussin—Dubreuil.* Dès Glaires, de leurs causes, et de leurs effets. Paris, 1831.

† Est ea quæ a viscosis adiposis, lentis humoribus in stomacho contentis excitatur; quod cognoscitur ex sensu gravitatis in ventriculo, ructibus insipidis, vomitione pituitæ insipidæ glutinosæ, ex assumtis oleosis, pinguibus sensu expletionis.—*Sauvages.*

‡ Oris humectatio nauseabilis cum mordicatione variorum.—*Cæl. Aurel.*

§ Quæ sumpto cibo temporaliter depellitur.—*Cæl. Aurel.*

Pathology.—This species of dyspepsia was noticed by Hippocrates as a form of repletion, was clearly distinguished by Celsus, (interdum stomacho pituita oritur,) and described by the sect of Methodists as a variety of their *stomachica passio solutionis* under the term *rheumatismus stomachi*, using that term in its etymological sense of fluxion, and not under its modern arbitrary limitation. Under *anorexia pituitosa* and *vomitus pituitosus*, corresponding with the French term *éstomac glaireuse*, Sauvages has correctly laid down this species of dyspepsia, and Cullen has included it in his local disease of *anorexia humoralis*. We may also find that this form of disease (or its appropriate symptoms) has not escaped the observation of most of our best writers; but it was more particularly singled out by Dr. Thomson in the Edinburgh Medical Essays, by the late Dr. Pemberton in his practical work on the diseases of the abdominal viscera; and we are of opinion that the disease to which Daubenton had his attention chiefly directed, was this particular form of dyspepsia. (Daubenton on Ipecacuanha, Lond. 1806.) We form our opinion on this point, however, as much from the nature of his remedy as the description of the disease, for he has indeed only described the symptoms common to slow and laborious digestion, the *concoctio tarda* or *bradypepta* of some authors.

The older physicians attributed this disease to a cachochymy of the fluids by which the cold phlegm becomes predominant, and they thought to explain the disorder by describing it as a fluxion of the degenerated humour to the chylopoietic organs. But there can be little reason to doubt that, however it may be induced, the proximate cause of this disease chiefly consists in a disordered state of the mucous follicles of the stomach, the *glandulæ aggregatæ et solitariæ* of anatomists. The nature of the symptoms will not acknowledge any other cause, and it would be difficult to find any other morbid condition to account for the peculiar matter so frequently vomited. That the disorder of the function of the mucous follicles may be frequently only a part of a more general derangement of the mucous surfaces of the stomach, is highly probable; but that the disorder also frequently predominates in the mucous follicles—nay, is sometimes exclusively confined to them,—we have ample proof in dissection, and it would certainly be highly unphilosophical not to admit it as a morbid condition of the stomach capable of giving rise to its own peculiar form of indigestion.

The disease of the follicles may be simply functional, or it may be organic, and both of these morbid conditions admit of great variety. Dissection shows us that a disordered state of the secretion of the mucous follicles may proceed from very different states of these organs. It may be the consequence of an increased development of the follicles which sometimes succeeds to inflammation, but frequently arises without it. In persons who had formerly suffered from gastric irritation, an increased activity of the secretion, and a remarkable development of the follicles, have been observed. "In opening certain bodies," says Andral, "we are struck with the vast quantity of mucus which sometimes covers the inner surface of the stomach or intestines. This mucus often forms a thick coating extended over a considerable surface. At the first view we might mistake this coating for the mucous membrane itself, which presents a white healthy appearance. Under the covering of mucus, the surface of the mucous membrane may, however, present itself in two very opposite states. Either there may be found under the mucus a bright redness of the membrane by which it has been produced, the more common state, or it may be found pale and without any trace of redness or injection. For the augmentation of a secretion does not necessarily imply the notion of a sanguineous congestion of the secretory organ." (Patholog. Anat.) It is possible, as we have already remarked, that these two opposite pathological states may also afford a distinction of symptoms to be hereafter ascertained by a clearer and finer observation, which may divide this form of dyspepsia into two different varieties, each arranged under their respective species of atonic and inflammatory dyspepsia.

That the accumulated mucus is the proximate cause of much of the painful feelings in this form of dyspepsia may be inferred from the relief which is experienced on its being ejected, as well as from its sometimes being the only thing which is ejected, the food and medicine being constantly retained. "The increased secretion of the glands of the mucous membrane of the stomach," observes Pemberton, "irritates the nerves of the stomach, and thus causes pain. When it is secreted in small quantities, it may be so enveloped by any food that is taken as to render it inert; or when it is secreted in larger quantities, it may be thrown up by vomiting after causing violent pain." For being indigestible by the stomach, when it accumulates, as it most frequently does during the night, it becomes a kind of foreign substance, the source of much irritation, giving rise to a great variety of uneasy and painful sensations, and frequently to habitual daily vomiting, a complaint which M. René Prus considers the cause of a considerable number of cases of hypertrophy of the muscular coat of the stomach, frequently mistaken for cancerous degeneration of that organ.

Method of Cure.—As in every species of dyspepsia, so in this, the method of treatment must necessarily consist of the following indications:—1. to render the process of digestion as easy as possible by a selection of food proper in kind and quantity, and suited to correct the morbid condition of the stomach: 2. to excite the function of digestion by exercise adapted to the strength and habits of the patient, calling forth the stimulus of demand: 3. to promote the function of digestion by restoring the harmonious action of the different parts of the alimentary canal, chiefly by preserving an open state of the bowels; and 4. to correct the particular morbid condition, the specific and proximate cause of this form of dyspepsia.

1. The patient should in his diet observe a cautious economy of liquids; his meals should consist chiefly of solid food, of the lean of animal food of such kinds as are easy of digestion, avoiding all that is fat, glutinous, and tough. His meat should be thoroughly dressed, never twice cooked, and his food should be taken hot. In general he should avoid fish, fruit, vegetables, cheese, milk, and eggs. Vegetables are at all times to be eaten sparingly; if prepared in the French fashion, they are certainly less unwholesome; but cabbages, all roots, and all bulbous vegetables, and all of a flatulent nature, are to be strictly forbidden. He should be careful not to drink before his meals; but plain light soup or broth, impregnated with the juice of vegetables, may be permitted in small quantities. Bread should be eaten stale, and the quantity should be limited. Malt liquors of every description are prejudicial, but a glass or two of dry wine, or sherry, sauterne, hock, or white hermitage, or a proportionate quantity of brandy and water may be allowed, and is frequently very useful. For breakfast, coffee is to be preferred to tea; and it is also in this case a good stomachic after dinner. Butter may also be permitted in moderate quantity; but whatever be the diet selected, the rule which is universal in dyspepsia, must not be forgotten—that a small meal of whatever kind is, *cæteris paribus*, more easy of digestion than a bulky one; and that by whatever plan of diet the patient has been restored, he must adhere to it for a considerable time after his recovery.

2. Horse exercise is the most suitable in this species of dyspepsia; but active walking, even to a certain degree of fatigue, sufficient to produce moderate perspiration, is frequently of great service. The exercise of the arms by the dumb-bells or fencing, of the chest by singing, reading aloud, or declaiming, is of much importance, and ought to be sedulously persevered in. Great advantage has also been derived from boat-sailing and sea-voyages, whether from exciting vomiting we cannot say: but no description of exercise ought to supersede friction morning and evening, either with the flesh-brush or with a glove made of a piece of coarse blanket; and, for obvious reasons, it is more useful when performed by the patient himself than when administered by an assistant.

3. The best aperients in this disease are the decoct. aloes comp. which is sometimes advantageously combined with lime-water; or pills consisting of equal parts of aloes, rhubarb, calumba, and soap; or equal parts of the pil. rhei comp. and pil. galban. comp. or pil. scill. comp. We have also found the lac sulphuris an aperient well suited to this complaint. The object ought to be to obtain easy, satisfactory, and consistent evacuations, which the lavement alone is seldom able to accomplish; but it may be used to promote the operation of other means.

4. In the early stage of the disease the disordered state of the mucous follicles is sometimes quickly and readily corrected by an emetic, probably by exciting and evacuating their contents. For this purpose ipecacuanha is to be preferred; and, when requisite, it may be rendered more active and efficient by combining it with the acetum scillæ. But though emetics, by stimulating and emulging the follicles, do afford considerable relief, their frequent repetition is not advisable; and in the more advanced state of the disorder, where vomiting becomes sometimes one of the most troublesome accidents of the disease, they cease to be serviceable. It has been found that, if ipecacuanha, instead of being taken in doses sufficient to excite vomiting, be administered in repeated small doses, it is of much more permanent use. With this view Dr. Thomson (Op. cit.) was accustomed to divide a full dose of ipecacuanha into several equal parts, which he directed to be taken in the course of twenty-four hours; and in the same way he was accustomed to divide a full dose of an aperient, (his favourite was the old-fashioned tinct. hieræ picræ, well replaced by our tr. aloes comp.) which he gave in the same way, in separate portions, alternating a course of aperients with a course of emetics. Daubenton used ipecacuanha apparently upon the same principle in much smaller quantities, restricting his dose from a quarter of a grain to two grains, just sufficient to occasion a slight vermiculatory motion in the stomach; but he only gave it once in the twenty-four hours, in the morning fasting. (Op. cit.) He recommends it to be given in water, wine, jelly, or in a lozenge. It is sometimes conveniently combined with the aperient. Where nausea is easily excited by it, we have been in the habit of uniting it with a little subcarbonate of ammonia, aromatic powder, cayenne pepper, or sulphate of quina; when flatulence is troublesome, with the pil. galb. comp. or the pil. scill. comp.; and when symptoms of acidity are present, we administer it in lime-water; we have often seen much advantage from modifying its action by such auxiliaries.

The sulphuret of potass in doses from a few grains to half a drachm alone, if the sensibility of the stomach does not forbid it, or combined with subcarbonate of ammonia, bitter extracts, aromatics, carminatives, with rhubarb, aloes, the pil. galb. or pil. scill. comp., as circumstances may indicate, is another remedy appearing to possess a specific action upon the mucous follicles. It is probable from a similar property that the sulphureous waters, as those of Harrowgate, Balaruc, Cauterets, and several others, have been found such efficient remedies in this disease.

Heidler of Marienbad also relates several speedy and perfect cures of this complaint by means of the Kreutzbrunnen mineral water. We have reason also to speak highly of tar water and lime water as valuable correctives of this morbid state of the mucous follicles.

Pemberton placed his chief reliance upon opium in union with astringents. In the incipient stages he was accustomed to give ten grains of kino and half a grain of purified opium, made into two pills, every fourth hour. He preferred kino to any other astringent, because, unless there was diarrhœa, it appeared to have no tendency to confine the bowels. This is not very different from the method of Prus, according to which Andral treated, at La Charité, a man who had for a long time vomited a certain quantity of transparent mucus resembling a strong solution of gum arabic in water. He gave him for a month from one to six grains of the watery extract of opium daily. The vomiting disappeared, and under the influence of this medicine, the ordinary effect of which is to disorder the digestion, the function of the stomach was entirely restored.

The good effect of these remedies may be protracted or increased by a suitable use of tonics, either bitters or chalybeates. The vinum absinthii was once a favourite remedy in this complaint. The pil. ferri comp., vinum ferri, tr. muriatis ferri, and ferrum ammoniatum are suitable forms of chalybeates, care being taken that the bowels are at the same time preserved in a soluble state. But the chalybeate mineral waters of Eger, Spa, and Pyrmont are much to be preferred to any medicine of the same class.

The morbid condition of the mucous follicles may also be corrected by exciting the action of the skin, by increasing its tone and vigour by friction as already noticed; but also by cold ablution with vinegar and water, or salt and water; by the nitro-muriatic lotion, by cold affusion, or the shower-bath, remedies corresponding to the ψυχρολουσία of the ancient Methodists. And in addition to them, if circumstances permit the patient to choose his place of abode, he should seek above all things for a dry air, that of the mountains in summer, and of the sea-side in winter; and to fulfil the last intention, the best climates of which we have experience are Nice, Genoa, and Brighton. But wherever the patient may live, he should as much as possible select the driest situation, where the drainage, natural or artificial, is most perfect.

[Some of the cases of what have been termed *Alkaline Indigestion* and *Neutral Indigestion*, appear to have been gastrorrhœa. The fluids, brought up by some of those who have the power of *vomiting at pleasure*, instead of being acid, have been looked upon as alkaline. Whether this be the case or not, we can readily understand, that there may be a deficiency of acids secreted by the stomach, as we know there frequently is a redundancy. In these cases of alkaline indigestion, acids—as the muriatic—have been found very beneficial, along with appropriate general management. Of late years, lactic acid, which has been presumed to be one of the gastric acids, has been strongly advised by Magendie, (*Formulaire*, &c., 9ème édit. Paris, 1836,) given in the form of lemonade. The recent researches of Liebig, however, (*Animal Chemistry*, edited by Drs. Gregory and Webster, Cambridge, 1842,) would appear to show that this acid never exists in the healthy stomach; and he affirms that the property possessed by many substances such as starch, and the varieties of sugar, by contact with animal matters in a state of decomposition, of passing into lactic acid, has induced physiologists too hastily to assume the fact of the production of lactic acid during healthy digestion.]

II. DUODENAL DYSPEPSIA.

Disordered digestion proceeding chiefly from derangement of the functions of the duodenum, and the other small intestines.

To say precisely where duodenal dyspepsia begins, or where gastric dyspepsia ends, would not be an easy matter. Subordinate processes in the performance of a complex function, conspiring for one general effect, the healthy actions of the stomach and duodenum, though different, are not easily to be distinguished; and though in disease their difference becomes more developed and more apparent by their discordance, it is more easy to describe than to mark the line which divides them. Nature indeed never separates things by strong or abrupt lines, though she stamps each with features sufficiently bold and clear to distinguish it from its neighbour. Her system is one continuous tissue of great variety and diversity, in which different parts are united together without sign of interruption or joining. In the coloured spectrum no one can say where one colour ends and where its neighbour begins, yet any one may distinguish its different colours, the violet from the blue, the blue from the green, each from its neighbour, and every one from the other. So in diseases having an affinity, where they approach each other they cannot easily be distinguished, whilst in their general character it would be difficult to mistake them. And, likewise, in the function of digestion, though such is the functional dependence of one part of the alimentary canal upon another, that one being affected speedily induces disorder in the remainder, yet attentive observation will discover the part primarily and chiefly deranged, the leading features, the permanency of some symptoms, indicating directly the part affected; whilst the more variable and less marked character of other symptoms excludes the derangement of other organs.

General Character.—Appetite generally little impaired, frequently keen, sometimes ravenous; the oppression, distension, pain, or other uneasy sensations, the signs of difficult digestion, not referred to the stomach, nor felt soon after taking food, but a considerable time, generally from two to four hours, after a meal; urine sedimentous; fæces more or less unnatural in appearance.

Although Hippocrates had distinguished between gastric and enteric dyspepsia, it would be difficult to single out from amongst the diseases described by the ancient physicians, any precisely corresponding with those of which we are about to treat, though most of their symptoms might be found in the *ventriculosa passio* and *phagedæna* of Cœlius Aurelianus, and in the *morbus atrabiliarius* and *morbus hepaticus* of the Greeks. Amongst modern writers it may be detected under the terms of *intemperies hepatis*, (*Sennertus*, lib. iii. p. 6,) *infarctus hepatis*, (Junckeri tabul. 39,) *dolor hypochondrii*, (Boneti Sepulchret. tom. ii.) *hepatalgia*.* But it was not until a knowledge of the anatomy and functions of the human body directed the researches of the physician, that the symptoms of these disorders began to be classed together, and the diseases to be traced to their seat. Hoffmann,† who dignified the duodenum with the name of the second stomach; and, because of the secretions poured into it, *ventriculus succentriatus*, commenced this important task, in which he was afterwards followed by Bonnazoli, (Transactions of the Academy of Bologna. 1745,) an academician of Bologna, by the elder Monro, (Edinburgh Medical Essays, 1752,) at a later period by Dr. Classen, (Sandifort's Thesaur, tom. iii. 1778,) and more recently by Dr. Warren, (On Headach, Medical Transactions); but the subject remained incomplete until the very scientific and practical essay of Dr. G. D. Yeats (Medical Transactions, vol. vi.,) on the diseases of the duodenum, delivered as the Gulstonian lecture for 1817. Availing ourselves of the assistance of our predecessors, we accordingly propose following the same course in treating of *duodenal dyspepsia* as we have attempted with gastric, dividing it into species according to the morbid condition of the organ, the essence and proximate cause of the disease. We should therefore have to speak separately of *atonic, inflammatory, irritable,* and *follicular, duodenal dyspepsia;* but the irritable form of the disease we do not profess to have yet ascertained. To the second of these species we propose subjoining a variety commonly met with in scrofulous habits, which may with propriety be distinguished by the name of *strumous dyspepsia.*

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* *Sauvages.*—Morbus est cujus præcipuum symptoma est molesta sensatio, gravativa, tensiva, aut alia quævis in regione hepatis; differt ab hepatitide defectu pyrexiæ acutæ.

† De Duodeno, multorum malorum causâ. Opera, tom vi. 1740.

I.—Atonic Duodenal Dyspepsia.

Synonyms.—Hepatalgia infarctus, intemperie frigidâ; aurigo frigidâ ab obstructione; gastrodynia biliosa, *Sauvages;* chylopoietic disorder, *Abernethy;* bilious dyspepsia, *W. Philip.*

General Character.—Sense of weight, fulness, or distension, or a heavy, dull, dragging pain in the right hypochondrium, felt generally some hours after eating; bowels confined; evacuations unnatural; urine dark-coloured and sedimentous; pulse slower than natural; skin rather sallow, and conjunctiva generally tinged with bile; no fever, but considerable languor and oppression.

Form of Disease.—When a person labouring under this disease comes to consult a physician for his complaints, it will seldom be found that he blames the state of the digestive organs, but, on the contrary, his physician will sometimes find him quite unconscious of their being in a disordered state; for his patient will tell him that his appetite never fails him, that he never finds any kind of food disagree with him, and therefore he is quite clear that his digestion has nothing to do with his ailments. He may complain of headach, affecting more particularly the back part of the head; of pain of the back, or under the right scapula, of lumbago, or pains in the joints; of pain or numbness of the right arm; of cough, dyspnœa, languor, loss of strength, or depression of spirits, or of many other similar sympathetic affections, but the disorder of the digestive organs has never drawn his attention. If, however, the physician enters into particulars, he will find that though the appetite be good, the digestion is laborious; that not immediately, but a considerable time after eating, the patient is oppressed, drowsy, and incapable of either mental or bodily exertion, and that he awakes from a nap uneasy, restless, fidgety, and irritable. This state of general discomfort is frequently attended with a sense of fulness, distension, or weight towards the right side, or with a heavy dull pain felt chiefly in some part of the right hypochondrium. This pain in the right hypochondrium extends sometimes to the back, frequently between the spine and the right scapula, or under the right scapula, or it corresponds with a dull pain felt chiefly at the top of the shoulder, or with numbness or dull pain extending down the right arm to the elbow, wrist, and little finger, more rarely with pain of the right hip, extending down the right leg. Under certain circumstances these symptoms are very much exasperated, and the pain in the right hypochondrium becomes very acute, accompanied with great anxiety or with spasm in the situation of the duodenum, and a sensation of weight in the hypochondrium and loins, amounting to a complete attack of gastrodynia. If the right hypochondrium be examined, more especially if the examination be made when the patient is in the erect posture, a fulness will be perceptible through the whole hypochondrium, more sensibly apparent when compared with the left; sometimes a circumscribed puffiness is perceptible in the site of the duodenum, most particularly just before the cartilage of the eighth rib, in which situation it is observed that pressure is disagreeable, sometimes occasioning a sense of oppression or dyspnœa. This puffiness not unfrequently disappears in a day or two, particularly after free evacuations of the bowels, and then gradually returns, but is sometimes quite stationary, and occasionally so obvious as to be observed through the clothes, more especially in females. On some occasions it is so circumscribed and prominent as to give almost the appearance of a hernia. Such a case we have met in consultation with our amiable and lamented friend, the late Professor Andrea Vaccá, of Pisa, which appeared to derive considerable relief from the pressure of a bandage. Instead of pain or sense of weight in the right hypochondrium, there is occasionally a feeling which conveys the notion of torpor, of stoppage in or dryness of the bowels, as if their contents made no progress downwards, to which frequently corresponds a sensation of fulness in the lower bowels, leading to ineffectual efforts to relieve them, and not rarely spasmodic stricture of the rectum. Or there is soreness or a sense of fulness below the pit of the stomach in the situation of the arch of the colon, but deeper-seated. These affections are disposed to occur in paroxysms, seeming to be connected with the state of digestion, for the symptoms are more or less relieved as the process of digestion is completed, or they are relieved by satisfactory evacuations of the bowels, and relief is even experienced as soon as the upper portion of the bowels is put in motion, often long before an evacuation.

With the above symptoms, distinctly referable to the seat of the disease, or in place of them, the patient may complain of headach, which, generally unaccompanied with nausea, commences with a feeling of uneasiness of the head, with indistinctness of ideas, and disinclination or incapacity for mental exertions, chilliness of the body, coldness and dampness of the hands and feet. The headach itself consists in a pain or dull aching, sometimes of the forehead, but more commonly of the crown or posterior part of the head, which is attended with restlessness, with intolerance of noise, with dazzling or mistiness before the eyes, or with the appearance of various colours or luminous forms. The headach is invariably much aggravated during the period of digestion; sometimes it terminates with the process of digestion in a few hours, but when it has become habitual, it may continue for one or two days. Instead of headach, there is sometimes a sense of fulness or of distension of the head without any fixed pain. Vertigo is occasionally the most troublesome symptom, and we have known it to persist uninterruptedly for weeks together; or the patient being seized with temporary loss of consciousness, and of muscular power of the limbs, falls down suddenly, without syncope or convulsion. Contractions of the countenance, rolling of the eyes, cramps or numbness of the limbs, are very common symptoms, and even hysteria, chorea, a fit of epilepsy or apoplexy, are not rarely connected with it. Rheumatic gout, aching pain in the knees and ankles, particularly of the right side, lumbago, pain of the back, especially in the direction of the right kidney, commonly aggravated by the recumbent posture, languor, lassitude, and weakness of the limbs, feeling as if the legs would give way, and sometimes actual paraplegia, are amongst the secondary affections of this disease. Fluttering, irregular action, and sense of distension of the heart, irritation of the larynx or trachea, causing a constant hawking or effort to expectorate, singultus, dyspnœa, and even asthma, are not unusual symptoms. A degree of spasm, sometimes stricture, with a sense of weight or load about the rectum, spasmodic stricture of the urethra, or difficult micturition, are not rarely observed in this complaint. The various forms of *ephelis*, *pityriasis versicolor*, some species of *herpes*, particularly *herpes præputiatis* and *circinnatus*, the *impetigo sparsa*, are the diseases of the skin which we have most frequently remarked as connected with this complaint, and their eruption is not rarely attended with relief of the internal disorder. Indolence, sluggishness, listlessness, or indifference of temper, want of the usual distinctness of ideas, a feeling of a cloud over the intellect, loss of memory, confusion of intellect, or oppression of spirits, are characteristic symptoms of this disease.

With more or less of the foregoing symptoms, either directly referable to a deranged state of the digestion, or secondary consequences of it, the appetite is observed to be seldom impaired, but on the contrary soon returns after eating, and even during the period of suffering is often preternaturally increased and voracious, sometimes unusually keen, particularly for food which disagrees, which last proves not seldom a premonitory symptom of an exacerbation of the complaint. The tongue is large, broad, soft, and flaccid, covered with a yellowish white mucous fur towards the root, but moist, slimy, and of a dull red colour towards the point and margin, presenting in general a flabby and sodden appearance. The bowels are costive, more rarely alternating with occasional diarrhœa, and the alvine evacuations when costive are hard, dry, and adust, of a dark brown or dull olive or greenish black colour; if more lax, generally of too light a colour, resembling that of whitish brown paper, of a dull clay or light brownish colour, and devoid of their natural smell; or sometimes yeasty, tape-like, sometimes of a faint yellow colour floating upon the water, giving out an odour like that of saliva, or frequently containing bits of undigested food, uncombined bile, or occasionally consisting chiefly of bile. The urine is unhealthy, not remarkably deficient in quantity, but dark-coloured, of a deep colour like that of mahogany or stale beer, but always sedimentous, either lateritious, or yellow, or cream-coloured, but more generally white and furfuraceous, and so copious as to be thick throughout like gruel, its surface being generally covered with an oily iridescent film. The pulse is soft, slower than natural, sometimes preternaturally slow or labouring, frequently intermitting or irregular, faint, and fluttering. The skin is dry, dull, flaccid and inelastic, and sallow, and the eye dull and tinged with bile. The feet are habitually cold, the sleep is heavy and unrefreshing; the patient either awakes frequently in the night, or is troubled with disagreeable dreams, and, instead of being refreshed, is oppressed with fatigue in the morning. When the preceding signs of deranged function of the organic system present themselves in combination with some of the complaints or sympathetic affections above specified, there can remain little doubt that they are referable to a deranged state of the duodenum, of which distension or irritation of that intestine is the consequence; and if the preceding signs of derangement of the organic system be present without any complaint, the physician may be sure that a process of disease is in progress which will sooner or later declare itself.

Pathology and Causes. — The particular process of the function of digestion, which is more especially deranged by this disorder of the duodenum, is that which, consisting chiefly in the mutual actions and re-actions of the chyme, the bile, and the other intestinal juices, has hence received the name of *encholosis*, and of which the result in health is chylification; and the proximate cause of this derangement is no doubt a pathological condition of the duodenum, consisting partly in deficiency of tone, partly in deficiency of sensibility, from which arises discordant action in relation to the stomach on the one hand, and the intestines on the other. For the duodenum allowing of the accumulation of the chyme, an impediment is opposed to the function of the stomach; the secretion of the bile, depending on the healthy state of the duodenum, is imperfectly solicited, and the peristaltic motion of the intestine being impeded, its discharge into the intestine is obstructed; while the other intestines cease to receive, both in kind and quantity, their natural material of operation. This disordered state of the duodenum rarely, however, originates in itself; from its intermediate position, it is more generally a consequence of an imperfect performance of the function of the stomach or of the large intestines; sometimes, but more rarely, it originates in the liver. If the stomach have not sufficiently subdued the food to a healthy and natural chyme, the duodenum becomes the recipient of unnatural ingesta, unsuited to its particular function, from which disorder must ensue. This state of things appears to us to be more liable to occur to those who, fasting long, are apt to swallow their meals hurriedly, and therefore masticate their food imperfectly, or to those who, ever intent on the business of life, eat, as they think, quickly,—a habit very constantly induced in those who have contracted the pernicious practice of reading or trans-acting business at their meals. The same effect which arises from the hurried, imperfect mastication of wholesome victuals, may also be induced by the ingestion of indigestible substances, and therefore the use of such things as the stomach has no power of digesting frequently leads to duodenal dyspepsia, as for instance, nuts or the kernels of fruits, hard indigestible fruits, crude vegetables, the seeds and skins of fruits and vegetables, cherry-stones and similar substances. The same consequence follows for the same reason in some great feeders, whose pylorus allows imperfectly digested food to pass; in this respect some persons, and particularly children, seem to have a great facility.

But a disproportionate quantity of the healthiest chyme poured into the duodenum quicker than the process of *encholosis* can be performed, or than its transmission can take place, must lead to precisely the same result as the passage of chyme imperfectly elaborated. This is the reason that children are proportionately more subject to duodenal dyspepsia than adults; for having in general a good appetite and a powerful gastric digestion, they are wont to eat at all hours and seasons, taking a second meal before the first is digested, so that the duodenum becoming distended with chyme which it cannot transmit, interrupts the discharge of the bile, and accumulation takes place. Of this we have a proof in the crapulous diarrhœa consisting of light-coloured stools, which so often ensues. "Children," says Dr. W. Philip, "are still more inclined to this accumulation than adults, most of their complaints being connected with this state of the digestive organs. Of children who are out of health, with the exception of those labouring under contagious diseases, not one in twenty will be found free from more or less of it; and their restoration to health is never permanent till the due action of the first intestine is restored." Precisely the same effect will, in the same manner, be produced by any cause impeding the transmission of the chyme from the duodenum onwards, though it be neither unnatural in quality nor disproportionate in quantity; thus leading to accumulation in the duodenum, to distension, and all the consequences of duodenal dyspepsia. Now this may arise simply from a confined state of the bowels, which, gradually propagated upwards, ends in inducing duodenal dyspepsia; thence we find that healthy people having vigorous powers of stomach, who, from sedentary habits or confining themselves to the passive exercise of a carriage, have their bowels confined, readily become subject to this form of dyspepsia.

The accumulation of fæces in the colon, which in some constitutions, by sympathy, induces atonic gastric dyspepsia, also by its pressure upon the duodenum mechanically interrupts its free action, and prevents it from discharging its contents. And the same consequence results from the postures necessary in certain trades and professions, which have the effect of opposing the proper evacuation of the duodenum. This unhealthy posture is found in the highest degree in shoemakers, as they stoop to their last; and we have certainly met with more cases of this disease in persons of that trade than in any other. Tailors, engravers, and many others whose occupation requires the same posture, suffer in the same manner; literary people and clerks, from bending to the desk or table, frequently suffer from the same affection of the stomach; the stooping of women in their sedentary occupations of needle-work, and still more the pressure of the stays or tight lacing, tend in no slight degree to the same result.

An accumulation of chyme in the duodenum, in whatever way induced, soon lays the foundation of its own increase and continuance, for its immediate effect is to impede or interrupt the proper supply of the bile, either mechanically, (the pressure of the contents of the bowel closing by compression the oblique valvular orifice of the common gall-duct,) or by preventing the proper peristaltic motion of the duodenum which promotes the flow of bile, or lastly by deranging the sympathy of the duodenum and liver, so that the mutual actions and re-actions of the bile and chyme—the process of *encholosis*—cannot have place, and the intestine is thus deprived of the natural stimulus for promoting the propulsion of its contents. In this way, therefore, a deficient supply of bile, without either an unhealthy state or an accumulation of chyme, may prove a primary cause of duodenal dyspepsia. Hence this form of dyspepsia is that which is induced by idiopathic icterus, and is reciprocally one of the most ordinary proximate causes of icterus. Or it may be that the sensibility of the duodenum being diminished or otherwise disordered, and the natural sympathetic relation between the liver and duodenum becoming deranged, the bile is not supplied in proper season, or a bile of a less active quality is secreted; for which reason the action of the duodenum begins to languish, and the disposition to accumulate is increased. Thus dyspeptics have for months, even years, a constant accumulation in this intestine; the duodenum never emptying itself thoroughly, a great portion of aliment is retained there beyond the due time, and is not evacuated before a fresh supply from the stomach has laid the foundations of other accumulations, until at last an enlargement evident to the eye as well as the touch often takes place.

This account of the manner in which atonic duodenal dyspepsia is induced, is in perfect accordance with the phenomena, explaining both the origin of the symptoms and the operation of the causes which more especially give rise to it. For we may thus see how the uncomfortable feelings in this form of dyspepsia are chiefly experienced a considerable time after taking food; how the stools present their unnatural appearances, how they are deficient of bile, resembling whitish brown paper, and sometimes as white as pipe-clay —an effect frequently observed to result from the action of opium upon the liver; how the chyme, being prevented from undergoing its proper changes, and accumulating, ferments and gives rise to diarrhœa of light-coloured sour-smelling stools; or how the bile, occasionally suppressed, occasionally accumulated, from time to time is copiously evacuated, and a bilious diarrhœa is the consequence; how, the secretion of bile being suppressed or impeded, the kidneys assume a vicarious function, and discharging what ought to pass by the liver, give rise to the unhealthy appearance of the urine; how the duodenum, from derangement of its function becoming distended by gas or by the accumulation of chyme, or irritated by food imperfectly digested, or by substances indigestible, may by its extensive nervous connections be the source of all the various sympathetic affections above enumerated; and, finally, how inflammation of its mucous membrane or lesion of its structure may be the result.

The peculiar character of disorders of the duodenum are well illustrated by a case of organic disease of that intestine related by Dr. Irvine, in the Medical Journal of Philadelphia, for August, 1824; several others are also upon record.

Treatment.—The morbid condition which constitutes the proximate cause of this disease readily suggests the indications for accomplishing the cure. These are obviously:—1. to afford present relief by unloading the duodenum; 2. to render the function of the duodenum easy of performance, *a.* by a proper regulation of diet, *b.* by proper exercise, *c.* by promoting a healthy secretion of bile, and *d.* by preserving an open state of the bowels; and 3. by seeking to correct the morbid condition of the intestine upon which the disease depends.

1. Unless the accumulation in the duodenum be the consequence of pressure from a loaded state of the colon, it is best evacuated by some aperient; otherwise an active enema affords the most immediate relief. For emptying the duodenum, senna is the medicine which deserves the preference, being well fitted to promote the action of that intestine. Dr. Wilson Philip observes that it has appeared more effectually to remove the fulness of the right hypochondrium, when it depends on morbid distension of the duodenum, than any other medicine equally mild in its operation. It is best given in the form of infusion with an equal part of some carminative water or some light bitter infusion, and its action will be rendered more certain and more satisfactory by the addition of a small quantity of tartarized potass or tincture of rhubarb, which has also a tendency to prevent griping; but if this unpleasant effect be much felt, it may be avoided by the addition of a few drops of liquor potassæ, of spiritus ammoniæ aromat. or a small quantity of tr. cardamom. comp. to each dose of the medicine. When there is any disposition to fever, the infus. sennæ comp. of the Edinburgh Pharm. ought to be preferred. It may be combined with manna and tartarized potass. Where senna does not agree, rhubarb is the next best substitute. It may be given in substance in some carminative water combined with sulphate of potass or tartarized soda. For this purpose it is not necessary that the aperient should, according to the prevailing practice, be preceded by a mercurial purgative. Mercurials are more efficient and more necessary after the duodenum has been already evacuated. The extract of colocynth, combined with extract of hyoscyamus, affords also a purgative adapted to this form of disease:—

℞ Ext. colocynth. comp.
Ext. hyoscyam. āā. ℈i.
T. fiant pilulæ xii. una vel bina hor. som. sum.

There can be no doubt that the duodenum is also sometimes spontaneously evacuated upwards by vomiting, and under certain circumstances this method may be imitated by art; but in general, emetics are found to be of little use, and, failing in the object, are liable to do harm.

2. *a.* In order to lighten the burden of the duodenum, and render its function easy of performance, a careful selection of such articles of food as are generally held to be easy of digestion, and a scrupulous adjustment of the quantity to the powers of digestion, are of all things the most essential. The reader may refer for ample regulations on this head to the regimen of atonic gastric dyspepsia. We shall content ourselves with observing in this place that the patient should eat his meals slowly, and that he should masticate his food with the greatest care. In order to avoid infringing these rules he should endeavour to avoid long fasting, which leads to full meals quickly devoured. It is in this sense only that we can understand the reason of that old man's practice recorded by Lord Bacon, in his Essays, who, when asked by what means he had preserved himself to so great an age, answered that he knew no other except that he never waited to eat until he was hungry or to drink until he was thirsty, by which he was able always to make a temperate repast; a rule of great value, provided we do not fall into the opposite extreme of eating too frequently. Small meals, then, eaten slowly and at moderate intervals, is the most comprehensive rule of regimen in this complaint. Patients should endeavour as much as possible to keep their minds disengaged at their meals; for they who are accustomed to read, or have their minds much occupied at table, are apt to eat fast and voraciously, and chew their food imperfectly. The food should be of that description which is entirely digested, and which leaves little excrementitial refuse. It should, therefore, consist chiefly of animal food, of stale bread, or moderate quantities of well-boiled rice. Light refreshing broths, which are entirely digested in the stomach, afford occasionally a good form of nourishment in this disease; but they should be taken in moderate quantities, and not every day. Wine in small quantities is useful, but malt liquors are to be renounced.

b. The activity of the function of digestion will be excited by proper exercise of the body carried to a certain degree of fatigue; active walking over uneven ground, coursing, leaping, cricket, fencing, the broad-sword, or dancing, each proportioned to the strength and habits of the patient, are the exercises most to be recommended; reading aloud, declaiming, and singing are also useful. Horse-exercise is also well adapted to this form of dyspepsia, particularly when the patient's strength is at all impaired.

c. In endeavouring to restore the healthy secretion of the bile, some form of mercurial cannot easily be dispensed with; but the employment of this mineral should be so managed as to produce the desired effect upon the liver with as little injury as possible to the other parts of the system. All that is here wanted is something that may speedily correct the disordered function of the liver; and it is therefore unnecessary to give it so as to be received into the circulating system. To effect this object its local effect on the alimentary canal is all that is necessary; for, whether it acts upon the liver by sympathy during its passage through the alimentary canal, or whether, absorbed from the alimentary canal, by the radical branches of the vena portarum, and circulating through the liver, it stimulates that organ, its effect is so direct that it may be considered strictly local. It is best given in moderate doses repeated daily until the quality of the alvine evacuation or the state of the urine is decidedly improved. A few doses generally suffice; and its long-continued use is never necessary. It is more advisable to administer it in sufficiently active than in repeated small doses. The particular action sought for from the mercury is more certainly obtained by combining it with a small quantity of extract coloc. comp. or extract of aloes, to which a minute portion of the powder of ipecacuanha may be added. The pil. hydrargyr. is decidedly the best form of mercurial in this disorder. It may be given in doses of from two to four grains.

d. The impediment which is opposed to the healthy function of the duodenum by a torpid state of bowels, is to be corrected by yielding a ready obedience to the calls of nature, and by endeavouring to establish an habitual evacuation by visiting the water-closet every morning after breakfast; by the use of the tepid water lavement morning or evening; and, failing these, by the use of the mildest aperients. According to our experience, those of which aloes forms the chief ingredient are the best. It may be combined with rhubarb, guaiacum, soap, and a small quantity of ipecacuanha, or James's powder; and in case of flatulence, with the pil. galban. comp. according to the formula already given. The aperient pill appears sometimes to be more efficacious and less injurious when taken with dinner. A convenient formula, given by Dr. Yeats, is the following:—

℞ Infus. anthem. ℥i.
Vini aloes ʒi.
Liquor. potass. gr. xv.

Fiat haustus mane sumendus. But he prefers a combination of senna and quassia, viz.:

℞ Lign. quassiæ ℈i.
Fol. sennæ ℈i. ad ℈iii.
Aquæ ℔i.

Fiat infusum.

℞ Infusi ℥iss.
Potassæ sulphatis ℈i.

Fiat haustus mane et meridie sumendus.

As soon as possible, attempts should be made to discontinue the use of these artificial means, for a constant recurrence to any aperient medicine is sure to establish ultimately a more permanent disease of the intestines.

3. Besides the means for fulfilling the last indications, all directly tending to correct the morbid condition of the duodenum, those which have the power of improving the tone of the alimentary canal in general, or the whole system, possess to a certain degree this power. Amongst the first we have seen the nitric acid in decoction of sarsaparilla or some light bitter infusion most advantageously used. Amongst the latter we may specify the cold ablution of the surface, the shower-bath, the nitro-muriatic acid lotion, and assiduous friction with the coarse flannel glove. But in obstinate cases we have found the most effectual remedy in a course of alterative aperient waters, as those of the Muhlbrunnen of Carlsbad, either natural or artificial; more especially if (which is not rarely the case) this disordered function of the duodenum be engrafted upon, or be the result of, a general state of excrementitious plethora.

II.—Inflammatory Duodenal Dyspepsia.

Synonyms.—Phagedæna, Cœl. Aurel.; hepatitis obscura; hepatalgia infarctus, intemperie calida; aurigo ab obstructione calida; hypochondriasis melancholica, *Sauvages;* hepatitis chronica, *Cullen;* indigestion, second stage of, *W. Philip;* duodenite chronique, *Cazimir Broussais.*

General Character.—Heavy dull pain; sense of weight or uneasiness in the right hypochondrium, confined to one point, or more generally diffused, more or less constant, but varying in degree, being sensibly increased a certain time after taking food, and in some degree subsiding as the process of digestion is finished; skin dry; extremities cold; but increased heat of surface during sleep, particularly of the palms of the hands and soles of the feet; complexion sallow; countenance dejected; urine scanty, high-coloured, and depositing a lateritious sediment; tongue more or less furred behind, of a glossy red colour at the point and margin, the redness being either bright, equal, or continuous, or brighter red points are dispersed over the general redness, or the papillæ unusually red, large, and developed, sometimes tuberose.

The form of dyspepsia which we are anxious to specify by the foregoing character, has been merged in the description of the diseases of organs considered more important, and whose functions were better known. By Hippocrates it was comprehended under atrabiliary affections; by Celsus and Aretæus it was not distinguished from the diseases of the liver or the disorders of the stomach; by the Methodists its symptoms were distributed amongst several diseases. The moderns have been misled by the same errors. Sometimes confounded with other diseases, we may find it under chronic hepatitis or hepatalgia, or, undue importance being attached to some of its symptoms, it assumes the name of gastrodynia or icterus, but still more commonly we may detect it under the mask of hypochondriasis or melancholy. Of the pathological condition which constitutes the disease, Cullen had a proper conception, and evidently includes it under *enteritis erythematica;* but he does not seem to have ascertained the symptoms of the particular disease, for he has nowhere described them except under chronic hepatitis. The disease is well described by Dr. Ferriar, of Manchester, who had himself been the subject of it, and was by him distinguished from diseases of the liver. Dr. G. D. Yeats followed up the observation of Dr. Ferriar with a spirit of practical and scientific inquiry; but it is to Dr. Wilson Philip that we are indebted for the full development of the nature of this disease and the distinct knowledge we possess of it, though we can by no means subscribe to the limitations by which he has defined its origin, or to the latitude which he has allowed to its issue.

Form of Disease.—The derangement of the function of digestion which arises from an excited state, from increased vascularity, or from chronic inflammation of the mucous membrane of the pylorus and duodenum, is by no means a rare species of dyspepsia, and although manifesting itself by a great variety of symptoms, is in no degree difficult of detection. Its symptoms are either direct, indicating the seat of the disorder, or indirect, showing the full and various play of sympathy by which the different parts of the body hold communication with each other. Of the former kind are the dull heavy pain, the sense of weight, of anxiety, or uneasiness, which, sometimes commencing in the epigastrium, is generally seated in the right hypochondrium. This uneasy feeling is either confined to one circumscribed point, or it is diffused over the whole hypochondrium; sometimes it extends from the epigastrium round the right side to the spine like half a zone, giving the feeling as if the side were begirt and compressed by a sickle; often the course of the pain traces with anatomical accuracy the course of the duodenum downwards, and backwards in the direction of the right kidney, and then again inwards towards the umbilicus; very frequently the pain extends directly backwards under the right scapula. The uneasy feeling of the right hypochondrium very often corresponds with pain of the right acromion, of the upper part of the right arm, elbow, or wrist, or with a feeling of weakness or numbness of the whole arm; occasionally it extends down to the thigh, to the knee, right leg, or ankle, giving rise to some topical pain in this extremity, or to a more general dull pain or sense of numbness, so that the whole right side of the body feels weaker than the left. When digestion is not in progress, the pain and uneasy feeling of the right hypochondrium is considerably less sensible, seldom amounting to more than a sense of heat, gnawing, or sinking towards the epigastric region, with a frequent desire to take food, which frequently corresponds with a sense of heat, smarting, or blistering of the tip of the tongue, and with watering of the mouth. By complying with this craving for food, relief is for a time afforded, but after a considerable interval, from two to four hours, the uneasy feelings are very much aggravated, in severe cases amounting to excruciating pain, bearing all the symptoms of a fit of gastrodynia, which continues for some hours, then gradually subsides; or which is at other times only relieved by vomiting, generally taking place three or four hours after taking food. The uneasy feeling does not usually amount to actual pain, but is described as a rawness and tenderness, and sometimes as a feeling of heat, as if hot water were passing through the intestine, or there is a painful feeling of distension, especially after meals, though no actual appearance of distension can be perceived. But often there is very sensible fulness in the same situation, extending downwards along the edge of the cartilages of the ribs and through the whole hypochondrium. The part of the right hypochondrium which is the seat of pain or uneasiness is also often very tender, the pain being sensibly increased by pressure, but generally it is not increased, on the contrary it is sometimes relieved by it. This tenderness is perceptible in the epigastrium, but most especially at the pyloric extremity of the stomach, and in the course of the duodenum, in the soft parts close to the edge of the cartilages of the false ribs on the right side; the cartilages themselves, often become very tender, not unfrequently more so than the soft parts. This tenderness on pressure, which becomes much more apparent if the effects of pressure of the right and left hypochondrium be compared, like the pain, is very often circumscribed, being generally situated midway between the point of the sternum and the lowest cartilage of the ribs: in the region of the pylorus it is generally more constant, in the region of the duodenum only occasional. The patient is in general quite unconscious of this tenderness until it is pointed out by the physician. But not unfrequently neither pain, uneasiness, nor tenderness is referred to the bowel; but when food has been taken a considerable time, the general uncomfortable feelings of the patient are very much aggravated, the process of digestion being attended with an insupportable languor, lassitude, oppression, dejection of spirits, headach, thirst, fever, or other sympathetic affections.

Amongst the sympathetic affections or indirect symptoms of this diseased state of the duodenum, the affections of the head are most frequent; they are either a general painful confused headach, increased by stooping or by holding the breath, or a dull pain in the back part of the head, which feels tightly bound, or painful pulsation of the head excited by the least effort of attention: vertigo is also a very common symptom. Not rarely the intellectual functions are very much weakened or disordered; there is a general confusion of mind, impaired memory, or deficient power of attention. The external senses become sometimes quite dull, the vision indistinct or veiled with dark motes; the hearing, smell, and taste much impaired. The entire function of the mind not unfrequently becomes disordered, and mania itself we have distinctly traced to local irritation of the duodenum.

Irritation of the larynx, producing a short dry cough, or causing frequent efforts to expectorate a grey transparent mucus, (which sometimes becomes very considerable,) hoarseness and loss of voice, a sensation of constriction of the chest with laborious breathing, and complete paroxysms of spasmodic asthma, are the sympathetic affections of the respiratory organs which frequently originate in this disease. In protracted cases of this disease, it is by no means uncommon for phthisis pulmonalis to supervene, and ultimately terminate the life of the patient. It most frequently assumes the form of laryngeal phthisis, but generally a tubercular affection of the lungs lurks behind. Nor does there seem any difficulty in understanding this issue of the disease; nothing is more comprehensible than that the irritation of the duodenum should be communicated sympathetically to the mucous membrane of the larynx, trachea, and bronchi, or that the cachectic state induced by the long-continued derangement of the digestive organs, should produce the tubercular disease. This conversion of dyspepsia to phthisis was noticed by Dr. Ferriar, but has been only fully explained and insisted upon by Dr. W. Philip (Op. cit.) and Dr. [Sir] James Clark. (Influence of Climate, &c.)

Painful affections of the heart are consequences not less common, simulating the character of hypertrophy of the ventricles, sometimes of angina pectoris.

The urinary and sexual organs frequently feel the effects of duodenal irritation: hence spasmodic stricture of the urethra, painful affections of the testicles, priapism, and venereal dreams; also painful menstruation. Lumbago, painful affection of the hip and knee joints, rheumatism, rheumatic gout, nodosity of the joints, severe and deep-seated neuralgic pains of the legs, we have observed connected with this disease.

Sometimes the skin is the seat of the secondary effects of this disease. We have noticed, in conjunction with it, *herpes zoster*, *acne induratum*, *urticaria*, *lichen*, *psoriasis*, *pityriasis*, and *alopæcia area*.

Inflammatory or spasmodic affections of either extremity of the alimentary canal are common attendants of irritation of the duodenum, such as erysipelatous affections of the fauces, generally with a sense of tickling, soreness, or rawness of the throat. The uvula sometimes becomes much elongated, and, losing much of its contractile power, gives the sensation of something resting on the back part of the tongue, and sometimes descending lower, creates a cough, a sense of choking, nausea, and even vomiting, frequently all comprehended under the common term of relaxation of the throat; not rarely the fauces and neighbouring parts are the seat of troublesome ulcerations, which, united with affections of the skin and osteocopic pains, make up the symptoms of pseudo-syphilis. On the other hand, *prurigo podicis*, sometimes accompanied with eruptions in various forms, spasmodic stricture of the anus or rectum, inflammation of the mucous membrane of the rectum, hemorrhoidal swellings, painful and irritable excrescences and fissures, are sympathetic consequences of this disease.

But whatever be the particular sympathetic affection which may result from the disorder of the duodenum, there is one general and constant which belongs and gives character to them all—hypochondriasis, despondency and dejection of spirits, the mind constantly intent upon and occupied with the bodily feelings.

The preceding complaints, whether direct or indirect, are always attended by symptoms sufficient to indicate that the natural functions of the body are in a state of disorder. Though the appetite may not be deficient, it is seldom natural; it is various and capricious, generally keen, craving, not rarely ravenous; there is a sense of sinking, of gnawing, or a constantly recurring desire for food, only temporarily relieved by taking it; or an uneasy sensation, or craving, mistaken for hunger—*mendax fames, cibi appetentia, corpore non indigente.* Bulimia is sometimes a symptom of duodenal irritation, corresponding to the *phagedæna* of Cælius Aurelianus, which we have accordingly not hesitated to place among the synonyms of this disease. There is no particular thirst. The bowels are habitually confined; under the use of animal food they are more costive; with a vegetable diet they are frequently disposed to be relaxed; a fit of bilious diarrhœa from time to time is not however a rare occurrence; and an habitually loose or irritable state of bowels is sometimes observed, a dejection following soon after a meal; purgatives also occasionally act in small doses, but frequently with aggravation, instead of relief, of the symptoms. In this state laxative medicines are generally uncertain in their effects, and frequently apt to act too violently. The evacuations present great variety in their appearance; they are not always different from those of health; sometimes they are perfectly natural, but generally mixed with mucus in a concrete tenacious state; more frequently they are scanty, adust, and hard, in small knots of a dark blackish green, frequently of a dark olive green, sometimes of a blackish brown colour; they are frequently smeared with mucus and deficient in smell; occasionally two or three dark fetid stools are discharged, small in quantity without being figured; or there is a loose stool of a greenish brown colour, in smell resembling the grounds of sour beer, which is often preceded by great depression of spirits; not rarely they are like tar. Generally they are too dark, and occasionally almost black, but frequently they are of a white clay colour; sometimes there is frequent purging of a substance like the whitest pipemaker's clay, more or less diluted with water; which state has been known to occur when dissection proved the liver to be free from disease, and the gall-bladder containing healthy bile. The urine is scanty, high-coloured, sometimes of a dark copper colour, or even opaque, and as dark as mahogany or porter: it always reddens litmus paper, and generally deposits a lateritious sediment. The tongue is smooth, or covered with a thin loose mucous fur towards the root, of a clear red colour, neither a bright nor a pale red; but its anterior part is spotted with small red flat spots of a darker or brighter red colour, not rising above the level of the surface of the tongue, the papillæ being very small or very indistinct; or the whole surface of the tip of the tongue and anterior margin is unusually red, with some of the papillæ more or less enlarged; and in this situation there is frequently a sense of heat, smarting, or of blistering, frequently distinctly corresponding with the uneasy sensation in the right hypochondrium. The tongue is always more or less furred towards the root, either with a thin shining coat anteriorly, or clean and moist. The lips always correspond with the state of the tongue; they are of a glossy red colour, or their cuticle is dry and exfoliatory. In protracted cases the lips grow dry, and are divided by fissures; the tongue is covered with a rough yellowish crust, brown towards the root; in some cases there is a peculiar raw appearance of the tongue and throat; at other times the tongue presents a peculiar red, dry, and glazed appearance.

The skin is generally dry and scabrous, sometimes scaly almost to ichthyosis; the complexion is dull and sallow, and the conjunctiva has invariably a tinge more or less of yellow. The pulse is either quicker than natural, or easily accelerated, but seldom ranges habitually above eighty. In the quality of the pulse there is always perceptible a certain degree of hardness or rather tension, which, according to Dr. W. Philip, is in its slighter degree easily detected, in feeling the pulse, by gradually diminishing the pressure of the finger. On some occasions it is very quick and small, but always with a certain degree of tightness, the most certain measure of the general state of the secretory surfaces. The temperature of the body is very variable and unequally distributed; sometimes there is considerable fever or feverish heat; sometimes chilliness independent of any change of temperature of the surrounding medium, at times interrupted by fits of oppressive heat; during the day the hands and feet are often obstinately cold, but after eating and during the night the palms of the hands and soles of the feet often become preternaturally dry and hot, and there is a tendency to partial heavy sweats, sometimes very profuse during sleep, more especially towards the morning. And not unfrequently there is a feeling of a slight but protracted feverishness when the pulse is not at all affected.

Pathology and Etiology.—That the symptoms we have just described are all referable to different degrees of increased vascularity, sometimes to inflammation of the mucous membrane which lines the pylorus and duodenum, there is little room to doubt. It has been directly proved by numerous dissections; it has been confirmed analogically by cases of organic disease of this part of the alimentary canal, where the pathological condition gave rise to increased sensibility of the mucous surfaces, as in ulceration; the nature of the remedies most usually giving relief afford strong confirmation of this opinion; and, were more direct proofs wanting, it is the only hypothesis capable of rendering a satisfactory explanation of the symptoms. For if we consider the nature of this pathological state of the mucous membranes, the various degrees in which it exists, the particular part of these organs in which it may be seated, whether above or below the termination of the common gall-duct, whether it may affect the whole mucous tissue, or confine itself to the follicles or to the villosities, and, lastly, the extensive sympathetic relation of these organs, by which the irritations of their morbid conditions may be felt and reflected, we shall be furnished with abundant elements from whose combinations it will be easy to explain all the variety of symptoms, direct and indirect, primary and secondary, constant and accidental, which the disease presents. We shall thus understand how the appetite, if there be no fever, instead of being impaired, is generally increased, sometimes keen and ravenous, though the bowels are habitually confined, knowing it to be the nature of the alimentary canal to have its peristaltic motion increased towards any point situated below, and diminished from any point of irritation situated above; how the erythematous state of the mucous membrane of the duodenum, disordering its peristaltic motion, may impede the flow of bile, and may in different ways derange the functions of the liver; how the secretions of bile, generally diminished, may be sometimes increased when inflammatory irritation exists about or below the orifices of the biliary ducts, thus leading to bilious diarrhœa, to imperfect *encholosis*, and all the variety of alvine evacuation; how an inflammatory action of the duodenum, even when existing only in a slight degree,—so slight as to elude the closest observation unless the mind be attentively directed to it,—may excite the liver to an unhealthy action, from which a state of erethism and irritability of the whole alimentary canal may ensue; and hence how purgatives act so irregularly;—or, on the contrary, how the vascular injection of the mucous membrane of the duodenum, being the effect of a sanguineous congestion of the liver, by which its freedom of circulation and its secretion is suppressed, may be attended with a diarrhœa in which the alvine evacuations are of a light colour; and how a particular form of jaundice (*icterus à plethorâ*) may be produced. The well-known sympathies of the different parts of the alimentary canal with each other, supply the means of accounting for the appearances presented by the throat, the mouth, and the tongue, and for the uncomfortable and painful symptoms which sometimes take possession of the other extremity of the canal; and the universal consent of the state of the alimentary canal with the body in general, or with some organs in particular, explains the multifarious secondary affections which may supervene upon this disease. (For a full account of the sympathetic relations of the duodenum with other parts of the body, the reader may consult with advantage Dr. Yeats's excellent paper, Med. Trans. vol. vi.)

Nor does it seem more easy to explain the symptoms of this morbid condition of the mucous membrane of the duodenum than to account for its production, if we consider the operation of the causes in which it originates. Thus it is that atonic gastric dyspepsia long-continued, (by which as it were the stomach shifts its function upon the duodenum, the pylorus being irritated by the passage of substances imperfectly digested, and the duodenum, instead of receiving a substance of the bland nature of chyme, becomes the receptacle of the crude residuum of an imperfect digestion,) is observed to prepare the way for this form of dyspepsia, and frequently to terminate in it—more rarely to be relieved by it. In the same manner, though the function of the stomach may not be imperfectly performed, if persons indulge in the use of substances which no power of digestion can assimilate, (as unripe fruits, crude vegetables, the seeds and skins of fruit, the kernels of nuts and stone fruit,) the operation and the consequence will be the same. And in like manner, when sufficient time has not been allowed for the digestion of one meal before another is taken, the duodenum becomes unnaturally distended, from which irritation and an inflammatory state of the mucous membrane may arise,—a circumstance which, occurring frequently in children, inducing a saburral state of the mucous membranes amounting to inflammation, constitutes the preparatory process to the particular remittent fever which afflicts that period of life. But from whatever cause gastric or intestinal fever may arise, chronic inflammation of the mucous membrane is one of their most constant sequelæ; and we must confess that our experience knows no cause of this form of dyspepsia more common than improper diet in the convalescence of those fevers. In persons habitually subject to dyspepsia, which naturally predisposes to irritation of the mucous membranes, an inflammatory state of the duodenum may arise from suppressed perspiration, from exposure to cold, particularly in dry weather, either hot or cold, as is frequently observed in the spring; and in the same way it is a common sequel of catarrh, and a frequent consequence of the retrocession of eruptions of the skin. But of all the causes capable of inducing this morbid condition of the duodenum, there is undoubtedly none more sure, and none more general, than the injudicious use of medicines in the treatment of other forms of dyspepsia, in which irritating drastics, heating tonics, and stimulants are lavishly and uninterruptedly applied to delicate and sensitive membranes, either already inflamed, or which they seldom fail to make so.

There is also another source of this disease which deserves notice, where it presents itself as a secondary affection, the consequence of a state of plethora or congestion of the vena portarum, from which results vascular injection of the mucous surfaces, giving rise, under irritation, to inflammation of a sub-acute or passive form, *dyspepsia hemorrhoidalis*, (Cullen); and also a corresponding form of disease which arises from plethora of the uterine system, where the menstrual relief has been insufficient, *dyspepsia dysmenorrhœaca* and *amenorrhœaca*. (Id.) Upon this state of disease it is not uncommon for menorrhagia from time to time to supervene. The irritation of teething in children, from some sympathy, direct or indirect, with the liver, the bile being suppressed and hepatic plethora induced, not rarely induces the morbid condition of the mucous membrane which constitutes this disease, *dyspepsia dysodontiasis*. Hence the light-coloured evacuations, and hence the discharges of blood, in short the dysentery of infants in dentition.

Treatment. — The method of cure of this species of dyspepsia naturally divides itself into the following indications: 1. to correct the morbid condition which constitutes the disease—to remove the vascular excitement or inflammatory state of the mucous membrane lining the pylorus and duodenum; and 2, to render the function of digestion easy of performance, by which the causes of the disease will be avoided.

1. The principle of this indication must necessarily be antiphlogistic; but its application requires nice and delicate modifications and adjustments to ensure its success, or the physician may plunge his patient into a state of depression which will frustrate his intentions. General bloodletting is seldom necessary; but if there be signs of general plethora, if the pulse be hard, tense, and resisting, if the pain of the right hypochondrium be severe, with much heat of surface, and much heat and dryness of the mouth and redness of the tongue, a small general bloodletting will be found to be the means which afford the most speedy and the most permanent relief. It spares the necessity of topical depletion, and renders a much smaller quantity of medicine necessary, facilitates its action, and ensures its success. When the symptoms indicate a state of plethora of the abdominal circulation, such as a full or varicose state of the veins of the lower extremities, swelling of the feet, pain in the loins, more especially in the sacrum, indicative of a hemorrhoidal disposition, dark-coloured or sedimentous urine, a large tongue, seemingly swollen with blood, and eruptions of the skin, the congestion is more speedily subdued, and with less expense to the constitution, by very small bloodlettings, repeated at intervals of a fortnight, than by any other method · and the result is easy of explanation—it seems as if the quantity taken away from the general circulation were supplied from the circulation of the vena portarum, by which the congestion is diminished, and freedom given to the passage of the blood in the hepatic system. Where either of the above-mentioned states is present, the local detraction of blood from the tender part of the epigastrium or hypochondrium by leeches or by cupping, to the amount of from four to twelve ounces of blood, according to the circumstances, will be found to satisfy the object of this indication; but if after a few days the symptoms do not indicate improvement, it must be repeated. Except in nervous, irritable, and easily excitable persons, it is often of general service and sometimes very successful to endeavour to induce a derivation of blood upon the hemorrhoidal vessels by the application of leeches to the margin of the anus. The antiphlogistic effect of both general and topical bloodletting may be increased, and rendered more durable by the various methods of counter-irritation and derivation to the skin. For this purpose we think the tartar-emetic ointment or plaster is much to be preferred to blisters; but these also are occasionally useful. In old and protracted cases we have known the greatest comfort derived from the long-continued use of a warm plaster, gently stimulating, sufficiently large to cover the whole hypochondrium. In cases where the obstinacy of the complaint justifies it, either yielding with difficulty or frequently recurring, no method of counter-irritation is to be compared to a seton, from which the most permanent good results are frequently obtained: it should be introduced obliquely in the direction of the cartilages of the false ribs.

In aid of depletory means, or where the degree of the symptoms have not called for them, considerable benefit may be derived from certain medicines which have a direct antiphlogistic effect upon the mucous membranes of the intestines. These, according to our experience, are castor-oil, nitrate of potass, antimonials, and vegetable acids. The castor-oil should be given in doses of a drachm, repeated once in the twenty-four hours; it is best given at bed-time for its soothing and antiphlogistic effect upon the mucous membrane; but in the morning, if its aperient action is desired. In inflammatory irritation of the pylorus and duodenum it is a most valuable remedy, often by its soothing effect acting like an opiate, and has the most direct and the most remarkable power in allaying and relieving a heated state of the mucous membranes of the pylorus and duodenum. We must confess that we know no medicine more eminently endowed with this property. In obstinate chronic cases of this disease, we have known a small tea-spoonful of castor-oil taken every night at bed-time, as long as the stomach could easily bear it, a remedy attended with the most signal success. The effects of the castor-oil upon the stomach afford a very good test of the nature of the morbid condition of its mucous membranes. In atonic dyspepsia it is borne with the greatest difficulty, producing nausea and vomiting; in purely irritable dyspepsia a small dose of castor-oil acts severely and with much griping; but if there be any degree of vascular excitement of the mucous membranes, it soothes and quiets, and its effect is often most useful in this way when it has no aperient action. Its good effects will not be frustrated by administering it in any mild carminative water, in emulsion, in coffee, or by combining it with a little liquor potassæ. The nitrate of potass given in repeated small doses is a useful medicine, and of considerable power in correcting the vascular excitement of the mucous membranes. It may be given in doses of from five to ten grains three times a day, in an ounce of water, to which a very small quantity of mucilage of gum arabic has been added. If there be much thirst, the nitrate of potass may be given in a saline draught; and if there be great irritability or restlessness, it may be combined with a small dose of the tincture of hyoscyamus, of lettuce, hop, or conium; if there be much dryness of the skin, it may be combined with a very small dose of vinum ipecacuanhæ, or Dover's powder. When the cold or atonic state of the stomach tolerates with difficulty the nitrate of potass, or as the symptoms subside, it may be exhibited in some bitters, as infusion of chamomile, quassia, or orange-peel, to which a very small quantity of spiritus etheris nitrici, tincture of cardamom, or orange-peel, has been added: tartarised antimony in very small doses, as small as one-twelfth of a grain, may be given with the same intention as the nitrate of potass, and, by determining to the skin, sometimes more efficiently. It may be given in various vehicles, which, acting as modifying agents, adapt it to the particular circumstances of each case, as in saline draughts, orange-flower water, camphor julap, infusion of quassia, and such like.

In a highly irritable state of the alimentary canal, small doses of colchicum or hydrocyanic acid are frequently of signal service, and may be combined in the same way as the nitrate of potass and tartarised antimony.

The general effect of these antiphlogistic means will be very much promoted by the use of the fresh-water or sea-water tepid bath, daily, or every alternate day.

The intention of this indication will also be indirectly fulfilled by those means which, promoting the healthy secretion of bile, give freedom of circulation to the liver; and therefore, not before, but after depletion suitable to the case, and in aid of and combined with the means above specified, recourse must be had to hepatic alteratives, chiefly mercurial medicines, which require great care and discretion in their use. The pil. hydrargyri is in general the most suitable form of this medicine; if the bowels are irritable, or if there be a disposition to diarrhœa, the pulv. hydrargyri cum cretâ is to be preferred; if the bowels are extremely sluggish, calomel. In recent cases it is most advisable to give five grains of pil. hydrargyri, or three grains of calomel; in protracted cases, small and repeated doses are to be preferred, one grain, sometimes half a grain of blue pill two or three times a day, the object being to obtain the action of the mercury upon the liver without irritating the mucous membranes. We think it better to give the medicine continuously until the secretion of the bile is improved, than interruptedly, thus keeping the body longer under the irritation of the medicine. When the mercury appears to be exciting the mucous membranes without promoting the secretions, which will be known by the increased redness and dryness of the lips and tongue, it may be prudent to interrupt the use of the medicine from time to time. The mercurial may be advantageously combined with other medicines, to modify and facilitate its action; as with small doses of the antimonium tartarizatum, or of the pulv. ipecacuanhæ, when it is desirable to influence the secretion of the skin; with nitrate of potass, pil. scillæ comp. to favour the action of the kidneys; with extract. aloes to promote the action of the bowels; with extract hyoscyami, extract. conii, or extract. papav. if there be pain or restlessness; with pil. galban. comp. if there be flatulence or hysterical symptoms; and with any bitter extract or aromatic confection, if it oppresses the stomach. We have seen no advantage in this complaint from the inunction of mercury, and have found it less easy to regulate its action in this way; besides it thus affects the whole system unnecessarily; and the advantage of mercury in this complaint being chiefly derived from its local action upon the liver, any thing more is pernicious, and whenever the least sign of salivation appears its use ought to be discontinued.

The use of mercury will be very much assisted by taraxacum, a medicine which has also a very sensible effect in soothing the mucous membranes; and in mild cases this last will alone suffice. When given in an efficient formula, it is a most valuable remedy in this species of dyspepsia. The extract may be given in infusion of hop, chamomile, or orange-peel, in the compound decoction of sarsaparilla, and in nervous patients in camphor julap, to which may be added, according to the intention, a small quantity of nitrate of potass, of sulphate of potass, of compound decoction of aloes, or spiritus eth. nitrici.

℞ Ext. taraxaci, ʒii.
Potassæ nitratis, ʒss.
Spiritus eth. nitrici, ʒi.
Infus. cort. aurant. ℥vi. M.

Cochleare amplum bis terve die sumendum.

The nitric acid, nitro-muriatic acid, and the solution of chlorine, are also useful auxiliaries after mercury, in some cases substitutes for it. They may be used internally in decoction of liquorice, or compound decoction of sarsaparilla, to either of which a little spiritus æth. nitrici may be added; or they may be used externally either in the form of bath or lotion. In case of diarrhœa supervening, their use should be immediately suspended.

2. This indication will be fulfilled, *a.* by a proper regulation of diet, suited to the degree of the complaint; *b.* by preserving an open state of bowels; and *c.* by assisting the function of digestion by mild tonics, and by proper air and exercise

a. In the slighter degrees of this complaint very low diet is seldom necessary; a little mutton or chicken may be taken daily, or every second day, and is preferable to a diet consisting exclusively of farinaceous food. In other respects it should be light, bland, and cooling, and in small quantities at a time: light refreshing broths or soups in moderate quantity, light puddings, arrow-root jelly, rice-gruel, blancmange of rice or semolina. In some forms of this disease it is sometimes necessary to restrict the patient wholly to a fluid diet, to jellies of amylaceous and farinaceous food, gruel, asses' milk, and jelly of Iceland moss. In ordinary cases the stomach requires a certain quantity of animal food, and in this species of dyspepsia the fat of animal food, particularly the fat of bacon, is more easily digested than the lean; and it appears besides to have a useful effect in allaying the irritation of the mucous membranes, and in assisting the action of the bowels.

In severe cases, where there may be a disposition to feverishness, any increase of heat of surface, thirst, or night perspirations, it is advisable to abstain from wine. It must at all times be taken in very limited quantity, and its use from time to time interrupted, but it need not be wholly abstained from, and the digestion is very frequently promoted by it. Seltzer water is the best beverage in this complaint; but we have not found any inconvenience from light table-beer in small quantities.

b. The warm or cold water lavement is the best means of preserving an open state of the bowels. If this does not succeed or cannot be used, castor-oil may be given in small doses night or morning; its aperient action may be assisted by combining it with manna, or a pill formed of pulv. aloes comp. two parts, and soap one part, may be used instead.

c. The process of digestion may in some degree be facilitated and assisted by light bitters, as the infus. quassiæ, calumbæ, or cort. aurant. to which some neutral salt, as the nitrate or sulphate of potass, may be added in small doses; by the mineral acids, as the phosphoric, the aromatic sulphuric acid, or nitric acid in small doses; or by the cautious use of wholesome wine in small quantities. But the means which restore the tone and strength of the body in general are far preferable. These are proper exercise, neither heating nor fatiguing, as horse exercise, or a sea voyage; dwelling much in the open air, in a dry open air; change of air and place; cold ablution with vinegar and water; proper clothing, warm but not oppressive; and gentle occupation of the mind; all which remedial measures have been already sufficiently noticed.

We must not, however, omit to mention the use of mineral waters in the treatment of the chronic form of this disease, which combine the means of at once fulfilling all the foregoing indications, and render it difficult to know under which head to class them. The most efficient of these according to our experience are the Kreutzbrunnen of Marienbad, and the sulphureous waters of Harrowgate. They may be taken warm or cold, as best may suit the sensibility of the stomach, its power of digesting or absorbing them. Their action should as soon as possible be derived on the bowels, and they ought to be continued until the healthy function of the bowels has been restored, and until the tongue has lost its heated and red aspect, and assumed a healthy appearance. In order to render their good effects more permanent, their dose ought to be gradually diminished. A course of goats' milk or whey drunk every morning in considerable quantities, has been known to have a similar effect. In Scotland and in Switzerland it is frequently had recourse to; and we heartily join the late Dr. Ryal in his earnest wishes that an establishment for the supply of goats' whey were formed upon our Brighton Downs, which afford every means of doing so, and where the adjacency of a large town promises a ready consumption. We are inclined to think that the disorders of the liver in which it has been found to be so useful, have been only forms of inflammatory duodenal dyspepsia.

Though the treatment of the primary disease has only occupied our attention, we do not think that the secondary or sympathetic affections which originate in it should be wholly left to depend upon it. We think, whenever symptoms can be relieved without interfering with the general plan of treatment, it is always useful, and ought always to be attempted. As has been correctly observed by Dr. W. Philip, the secondary affections undergo the same change and partake of the same nature with the disease from which they spring; therefore the secondary affections in this disease are apt to assume an inflammatory character, to become more and more of a permanent nature, in the same proportion more independent of the original disease, and, on that account, more demanding the physician's careful attention. But with this passing observation our limits oblige us to leave them to be each considered under its proper head.

Strumous Dyspepsia.

Under this title we are anxious to draw the attention of the profession to the form of dyspepsia which belongs to the scrofulous constitution, for in our opinion it presents a more characteristic feature of this habit of body than any physiognomical portrait which has yet been drawn of it. In this respect it is more to be depended on than either the fine skin, the clear delicate complexion, the light hair, large blue eyes, and dull sclerotica of one variety; or the foul, dull, swarthy-coloured skin, the sallow complexion and swollen countenance, the dark hair, and tumid upper lip of the other. It betokens, indeed, little familiarity with scrofula to connect it with any particular temperament, for it belongs to all temperaments, to the sanguine as well as the phlegmatic, to the nervous as well as the melancholic, and to all their varieties and combinations. But upon whatever temperament the disordered habit which we call scrofula may engraft itself, we venture to say that this form of dyspepsia will also there be found; and, therefore, being constantly present with it, preceding and accompanying the various symptoms which issue from it, it would be contrary to all reason to refuse to it an important share in the development of this disordered habit, and in the production of the local affections which have hitherto too much engrossed the attention, to the exclusion of a proper consideration of the constitutional disease.

Of late years, however, the constitutional affection has received more of the notice of physicians. It has been described by Malfatti of Vienna under the name of *latent scrofula*, by Dr. Ayre under that of *chronic marasmus*, and most faithfully by Dr. [Sir] James Clark under the term *tubercular cachexy*; it has also been sketched by Dr. Marshall Hall under the title of *disorder of the general health in tuberculous affections*; but we are not aware that any of these physicians have connected it with a special disorder of the chylopoietic function.

Form of the Disease.—In the offspring of scrofulous and also of dyspeptic, hypochondriacal, or cachetic parents, in the children of old men, in children who have been badly nursed, or who, brought up by hand, have been improperly fed, or reared in the impure air of crowded towns, symptoms of disorder of the function of digestion early manifest themselves, generally between the first and tenth year, often commencing with the first dentition, which is commonly painful and difficult. Though the child from time to time loses its appetite, it is generally morbidly craving or ravenous, even soon after a plentiful meal requiring fresh food, so that the nurse remarks there is no satisfying such children. The complexion loses its colour, the skin its tone, ceasing to compress the flesh; the flesh becomes soft and flabby, the appearance is languid, the belly generally tumid, and there is a want of the usual disposition to play, or to use the exercise common to that period of life. The little patient is soon tired, complains of aching of the legs and knees, desires frequently to be taken up; his temper is fretful, he is easily set a-cry, and his intellect is either precocious or unusually dull. His sleep is seldom calm and composed; he moans, talks, or grinds his teeth, sometimes screams and raves. His bowels are generally confined, and his evacuations are of a light grey colour, like pale brown paper, sometimes curdled with streaks of mucus; or they are of a greenish colour; frequently yeasty, of a sour and highly offensive smell, and very often the food is passed unchanged. Diarrhœa occasionally occurs, consisting usually of light-coloured or slimy stools, and the patient frequently complains of pain in the bowels or uneasiness of the stomach. The urine often deposits a whitish sediment; the breath is fetid or heated; there is some slight thirst, slight heat of skin, except on the extremities, which are colder than natural; the skin is harsh and dry, except during sleep, when there are frequently heavy but partial sweats. The tongue is redder than natural, and on its anterior part spotted with small points of a darker and brighter red colour than the general surface; it is seldom much furred, being either covered with a thin mucous fur, through which the red spots appear, or with a slimy brownish coat, or the fur is distributed in small circular white spots, more or less confluent, presenting altogether a dappled appearance. When irritation of the stomach supervenes, the tongue is dry and of a brownish red colour. These symptoms, seldom entirely absent, continue from time to time to recur, more or less severe in degree, as the causes of derangement, irregularities in diet, an indulged and pampered appetite, may present themselves, being always most remarkably manifest after any of the ordinary diseases of childhood. As the child grows, unless the most judicious management has interfered with the natural progress of the complaint, other symptoms begin to appear. The patient becomes subject to sore throat, the fauces are redder than natural, and the tonsillary glands are observed to enlarge; there is a frequent tickling cough, and itching and picking of the nose and lips. The hands and feet are usually very cold and damp, or on the least cold turn of a dark livid purple colour, and the child is extremely subject to chilblains, even sometimes in summer. The patient is liable to be troubled with various affections of the skin, very early with *porrigo furfurans*, *psoriasis guttata*, *achorous* pustules on the hairy scalp, (the *tinea mucosa* of Alibert,) with *pityriasis*, *herpes circinnatus*, with *lichen* and *purpura*, frequently the *lichen urticans* and *purpura urticans*, at a later age *ichthyosis*, *pityriasis versicolor*, *porrigo decalvans*, *erythema nodosum*, and *porrigo favosa*, sometimes spreading over the whole body, and at a still later period of life, *acne indurata*, one of the most characteristic signs of this habit of body. All these diseases of the skin, in their external appearances so dissimilar, have yet in their nature a close affinity to each other, and, frequently convertible into and succeeding each other, seem only different external manifestations of the various degrees and modifications of the irritations of the internal organs. The eye is frequently the seat of various troublesome affections; hordeola constantly recurring, inflammation or purulent discharges from the ciliary glands, falling off of the eye-lashes, &c. Occasional discharges of blood from the bowels, epistaxis at a much earlier age than usual; copious mucous discharges from the bowels, sometimes from the vagina, are not rarely observed in this disease. Sometimes the cellular system feels exclusively the effects of the internal disease, a succession of cold indolent abscesses occupying every limb of the body. Frequently the nervous system is the seat of the secondary irritation, sometimes in its membranes and vascular structure, giving rise to inflammation and hydrocephalus; sometimes in its functions, inducing chorea, epilepsy, idiocy. The bones very commonly manifest symptoms of disorder, but the ordinary termination of the disease is the formation of that morbid growth or deposit well known under the name of tubercle, which, most usually seated in the lymphatic glands, has almost exclusively received the name of scrofula.

In young females about the age of puberty this disease frequently undergoes a remarkable change; for habitual constipation becoming established, another form of dyspepsia is induced, which in this constitution very frequently leads to spinal affections.

In the adult age the symptoms present considerable modification. The patient's complexion becomes pale, of a slightly blueish or leaden colour, particularly under the eyes; in dark complexions it becomes of a pale sallow or yellowish colour; the body is more or less emaciated, the skin flaccid, the muscles flabby; there is an unusual sensibility to cold, the patient is very apt to shiver, and there is a constant tendency to coldness and lividity of the extremities. The appetite continues good; frequently it is craving, and the food does not appear to satisfy; sometimes there is a constant empty and sinking feeling at the stomach, only temporarily relieved by eating, the patient feeling after a meal as if he had long fasted, and is again desirous of taking food. The bowels are confined; more rarely they are loose, discharging copious light or drab-coloured stools, which are frequently more than usually fetid. The urine generally deposits a whitish sediment, sometimes mucus. The tongue is red at the point, generally studded with enlarged papillæ, of a brownish red colour behind, but seldom coated. The pulse, always weak, is small and drawn, sometimes it is slow and weak. The sleep is seldom natural, the patient is restless during the first part of the night, and towards morning falls into a heavy unrefreshing sleep, during which he sometimes perspires profusely. He is listless and drowsy by day, and though the spirits are sometimes sufficiently cheerful, more commonly the patient is timid, nervous, torpid, or hypochondriacal. Frequently there is a great tendency to perspiration on the least exertion or the least excitement, and the palms of the hands and soles of the feet feel damp and clammy, frequently cold. The thyroid gland, the lymphatic glands of the neck and groin, are observed to be large and swollen, but not painful. In women, leucorrhœa, painful or deficient menstruation, in men, a disposition to hemorrhoids, is observed; but the usual progress of the disease is to tabes mesenterica or phthisis pulmonalis.

Pathology.—The phenomena of this disease, its whole complexion and character, sufficiently indicate a congestive state of the hepatic system; and were we to assume as the proximate cause of the disease a plethora of the vena portarum, both in its roots and branches, we should be furnished with the means of explaining all the symptoms of the disease; for we should readily understand how, in this state of the circulation of the abdomen, the mucous surfaces of the intestines should be full of blood, consequently subject to inflammatory irritations and disordered functions, whilst the peculiar office of the duodenum renders it especially liable to be the seat of them: how the function of the liver being deranged, all the other consequences of this disease may follow; for though we may not know precisely what share the function of the liver may have in the process of sanguification, we may easily understand how it may interrupt and interfere with this process, leading to a cachectic state of the fluids, from which result tubercles and other semi-vital and semi-organic productions. (For a further explanation of this opinion, we refer the reader to our account of the formation of tubercles in Dr. [Sir James] Clark's work on Climate.) Nor does it seem an improbable supposition that a disposition to abdominal plethora, or an organization which favours it, may be transmitted by parents to their offspring, more especially in dyspeptic and hypochondriacal persons, in whom the chylopoietic viscera, under constant irritation, are necessarily also in a state of congestion: we might thus explain how the strumous cachexy is continued, and how it is generated.

The foregoing view of the nature of this disease is also in conformity with the observation and opinions of other physicians. "In children," observes Dr. Wilson Philip, "the symptoms of inflammatory dyspepsia supervene early, and the disease in them commences in the liver rather than in the stomach." And Dr. Ayre has, in the following passage, confirmed our statement, though we have offered another explanation of it: "Diseased mesenteric glands occur in children from acrid condition of the duodenal contents; the liver, pancreas, and duodenal glands become diseased from congestion, and irritation will be propagated to the brain, giving rise to hydrocephalus, spasms, convulsions, vomiting, contortions of the countenance, affections of the sight, violent headachs, faltering voice, chorea, palsy."

Treatment.—The plan of cure of this disease consists in the following indications: 1, to correct the morbid condition of body which we have stated to constitute the essential foundation of the disease; 2, to render the function of digestion easy of performance by a regulation of diet suited to the nature of the disease; and 3, to improve the general tone and strength of the body.

1. In the ordinary degree of this disease, it is seldom necessary to relieve the congestive state of the liver by the detraction of blood; but when there is much febrile excitement, with a red and dry tongue, with fulness or tenderness of the right hypochondrium, the application of a few leeches brings more immediate relief, and spares the necessity of much physic. In general, the direct antiphlogistic part of the treatment is accomplished by a light diet, by the nitrate of potass given in repeated small doses, either in saline mixture or in some carminative or bitter infusion, as the case may admit, whilst the intention of this indication is also obtained indirectly by increasing the secretion from the liver. We entirely agree with Dr. W. Philip in his high estimation of this remedy, the nitrate of potass. Of itself partly a substitute for mercury, when combined with it, it renders less mercury necessary; with purgatives, it renders their action more free, and with antimonium tartarizatum it is invaluable in case of determination to the head. For promoting the secretion of the liver, mercury is the medicine most usually resorted to; as an occasional remedy for regulating the secretion of the liver, it is also probably the most safe and the most convenient. It should, however, be given only in interrupted doses, and should on no account be allowed to affect the system. The hydrargyrum cum cretâ combined with a few grains of subcarbonate of soda, and a minute quantity of pulvis ipecacuanhæ, or pulvis Jacobi, we consider the best general formula. If the bowels are too open, the mercury may be combined with the pulvis ipecac. comp.; if confined, with a little magnesia, nitrate of potass, or extract of aloes; but in either case this alterative should be followed every morning, or every second morning, by a tea-spoonful of castor-oil, by a little electuary of cassia or senna, or by a small dose of sal polychrest. The effects of the mercurial medicine will be also very much promoted by following it up with a course of taraxacum or sarsaparilla, or both united.

The action sought to be induced upon the liver, and through that organ upon the abdominal circulation, by means of mercury, may also be obtained by means of iodine, in our opinion more efficiently and more permanently; and where the inflammatory state of the mucous membrane of the duodenum exists in a slight degree, we think that it merits the preference. We have been in the habit of using the tinct. iodin., and have had much satisfaction in its use in strumous affections, but we have always observed that its value has been invariably in the degree in which it acted on the liver. We have made it a rule to commence in small doses, gradually increasing them; and though we have never seen any untoward consequences from its use, we have invariably observed the precaution of from time to time interrupting its exhibition for a few days. Where there is any hemorrhagic or scorbutic tendency, shown by eruptions of the nature of purpura, iodine is decidedly contra-indicated. It is probable that the muriate of lime has a similar action upon the liver, and may be advantageously used for this purpose.

In chronic cases we have seen the greatest advantage derived from a course of the Kesselbrunnen of Ems; and when there is any tendency to diarrhœa, we believe it to be preferable to every other form of medicine. The Obersaltbrunnen may be also used in similar circumstances.

When the state of the mucous surfaces admits of the exhibition of chalybeates they prove an alterative of very great value, and possess considerable power of correcting the congestive state of the abdominal circulation. This property of chalybeates has in our opinion been very much overlooked; for though they are usually administered in this disease, they are never exhibited with this intention. The chief obstacle to their use is the state of the mucous surfaces; for if they be not in a cool and secreting state, chalybeates are repugned by them as irritants. On this account it is most advisable to select the salts of steel the least exciting, as the ferrum tartarizatum, or to qualify the chalybeates by saline refrigerants, as by uniting the carbonate of iron with small doses of the nitrate or the sulphate of potass; or, best of all, by giving the remedy in the form of some saline chalybeate water, as the Eger. We have lately been in the habit of combining the iodine with chalybeates, and we think with very considerable benefit. They appear to correct and promote each other's action. This is our formula:—
℞. Tr. muriat. ferri, tr. iodinii āā ʒii. aq. puræ ℥ss. Guttæ x. ad xxx. ter die sumendæ.

The congestion of the hepatic system may also be relieved by increasing the action of the kidneys and skin; that of the former will be promoted by the alteratives already mentioned; and that of the skin will be excited by the tepid sea-water bath, by sponging the body with vinegar and water, or salt and water, by the use of the nitro-muriatic acid lotion, by warm clothing, and by exercise; and, failing this, by gentle friction of the whole surface of the body for at least half an hour daily.

Unless a free and open state of the bowels be made to concur with the preceding remedies, they will prove abortive; but violent purging by irritating medicines is equally to be avoided. A soluble state of the bowels, procured by such mild remedies as have been already mentioned, is all that is to be desired. Sometimes a course of purging by the sal polychrest or the Harrowgate salts is of service, and when a sluggish state of the colon coincides with this disease, it is absolutely necessary that this intestine should be unloaded and preserved so.

2. Except under occasional febrile symptoms from an aggravated degree of the disease, the antiphlogistic regimen is unnecessary, and it ought never to be long-continued. According to our experience a limited diet of animal food, nutritious and easy of digestion, answers best. The meals should be small, consisting chiefly of animal and farinaceous food; all vegetables and fruits ought to be avoided, or used very sparingly. Cows' milk seldom agrees well, and ought therefore to be considerably diluted; occasionally a little beef-tea or plain bouillon answers very well as a substitute for breakfast when milk is found to disagree. Wine, porter, ale, and beer are unnecessary, and therefore better avoided. In this disease fish is a very unwholesome food.

3. In ordinary cases, when the organs of nutrition are restored to a healthy state, the natural resiliency of the constitution can generally dispense with artificial assistance; but with feeble powers of body—a marked feature of the disease of which we are treating—some further help is necessary. We cannot, however, speak much in favour of internal tonics, excepting chalybeates, (which we do not view simply in the light of tonics,) and of them we have already said enough. More benefit is derived from tonics externally applied. Of these, unquestionably the most powerful is the cold sea-bath, and the most beneficial, unless it produces languor and chilliness. The shower-bath, cold ablution, exercise in the open air, in a dry free atmosphere, either by the sea-shore or in an elevated situation. The exercise should be moderate, chiefly on horseback, or for children, on donkeys. Amusing plays, moderate and agreeable occupation of mind; gentle friction over the whole surface for half an hour every evening; and lastly, occasional change of air and change of habits.

III.—Follicular Duodenal Dyspepsia.

Synonyms.—Hypochondriasis pituitosa; (*Fracassini*, cap. 4. p. 388;) *Auct. Var.;* aurigo frigida ab obstructione, *Sauvages;* infarctus, *Kümpf.;* painful affections of the intestinal canal, *Powell.* (Med. Transact. vol. vi.)

General Character.—Symptoms of painful or difficult digestion, felt chiefly a considerable time after taking food, most frequently observed in phlegmatic habits; occasional alvine discharges of mucus in various morbid states; acute attacks of gastrodynia or jaundice sometimes intervening.

Form of Disease.—In persons of a cold temperament and relaxed habit, characterized by softness and want of elasticity of fibre, dark carbonized blood, a slow circulation, a soft pulse, low animal temperature, yellowish or chlorotic, and sometimes swarthy paleness of the skin, who are also much disposed to sleep, showing great languor, sluggishness, and apathy in their feelings, and betraying a want of decision and energy in their moral and intellectual character,—disorder of the duodenum assumes a particular form, depends upon a peculiar morbid condition, and manifests itself by certain characteristic symptoms.

The general progress of this species of dyspepsia is insidious, and can hardly be distinguished from the other forms of duodenal disease, except that the appetite is commonly much impaired, sometimes to loathing. There is great languor, lassitude, and incapacity for every exertion. The patient complains of a sense of load, distension, or pain, some hours after taking food, and the digestion is accompanied with flatulence, oppression, anxiety, sometimes amounting to a feeling of suffocation. There is no remarkable loss of flesh, but the appearance of the skin is much altered; the complexion becomes bloated, loses its colour, is dull and cloudy, sometimes swarthy, frequently clammy, greasy, or waxy, as if covered with a thin film of melted wax; or the skin is sallow and somewhat jaundiced; it feels generally cold, moist, and clammy, the hands and feet particularly so. The lips and gums are generally pale; the tongue is moist, pale, and flabby, covered with a pearly white mucous coating, but seldom much loaded; sometimes there is a thick, shaggy, cottony fur. The mucous coating of the tongue often has the appearance of a false membrane, which, falling off in pieces, leaves patches quite clean, sometimes red, and morbidly tender. The bowels are almost always constipated, but diarrhœa is sometimes, though rarely, observed; the stools are light-coloured, porraceous and abundant, out of all proportion to the ingesta, and having often a faint mawkish smell; occasionally they are dry and dark-coloured, more frequently fluid and dark, of a greenish or brownish black colour, and not uncommonly dark, viscid, and pitch-like. But the characteristic features of the evacuation are considerable quantities of mucus, which are discharged in various morbid states and forms: sometimes it resembles transparent jelly, or is glairy like the white of an egg; frequently yellow and viscid like the yolk of an egg; sometimes it assumes the solid form, appearing in concrete masses varying in size and figure, frequently resembling small bits of tallow, wax, suet, or bits of the blanched kernel of walnuts; in other cases it appears in large shreds of a semi-transparent membrane of considerable tenacity; or large quantities of flakes mostly torn into irregular shapes, and appearing to have formed parts of an extensive adventitious membrane of no great tenacity or firmness; sometimes the membrane is passed in perfect tubes of considerable extent. Frequently it is passed in solid cylindrical forms like shreds of boiled maccaroni or vermicelli, not rarely mistaken for the detritus of worms; and on some occasions considerable quantities of mucus of a purulent appearance are discharged at once, leading to the supposition that an abscess has burst internally. These discharges of mucus appear to take place periodically, and as it were critically, being in general preceded by considerable aggravation of the symptoms, whilst the recovery is attended with evacuations of quantities of mucous or glutinous substances.

In these attacks the patient is sometimes suddenly seized with acute spasmodic pain in the right hypochondrium, darting through to the back, frequently accompanied with vomiting or a hard dry cough, by either of which the pain is greatly exasperated. Often there is sudden and excessive pain towards the epigastrium, returning with vomiting, in violent paroxysms. These pains are occasionally rather relieved by pressure; but the parts are frequently so sensitive that the slightest touch cannot be borne, and even during the intervals of the pain the patient complains of great tenderness and soreness in these parts. The tongue, already coated with a white fur, becomes dry, the pulse accelerated, the stools white, the urine turbid and of a dark red colour, like blood. As the pain remits, the patient is bathed in a profuse perspiration. After a day, sometimes longer, the skin becomes jaundiced, and on examining the evacuations, instead of gall-stones, as he expected, the physician finds copious flakes of mucus in various forms, which are passed with considerable relief to the patient. This mucus, sometimes fluid and approaching to pus in appearance, has, in connection with the foregoing symptoms, frequently imposed the disease upon the attendants for the rupture of an abscess of the liver; but the same symptoms and the same discharge occasionally occur without jaundice or any symptom of hepatic obstruction.

The urine, in the ordinary progress of the disease, is extremely variable; in the early stage it is rather pale and abundant, occasionally crude and transparent like water, and voided in considerable quantities; but during the severity of the symptoms this secretion becomes very deficient, high-coloured, and extremely loaded, sometimes of a deep orange colour, unless there be some obstruction of the biliary secretion, when, as has been already observed, it is of a dark blackish brown colour, like porter, or, mixed with a copious lateritious sediment, it almost resembles blood. The pulse, except during what may be called the acute attack, is always weaker than natural, generally slow and small, more rarely frequent and small, or wiry and fluttering.

The seat of the disorder may entirely escape the notice of the patient and even the observation of the physician; the chief complaint, frequently the only object of the treatment, instead of indicating any derangement of the function of digestion, may be an affection of another part of the body, some of the multifarious symptomatic diseases which originate in this disorder. Among the secondary affections which occasionally accompany this morbid state of the small intestines, (for we do not pretend to confine it strictly to the duodenum,) are, a remarkably altered state of the temper and feelings, languor, indifference to every thing, complete apathy, sometimes stupor or fatuity, sadness, great depression of spirits, obstinate melancholy, great irritability of temper, moroseness, obstinate silence and reserve. Sometimes the patient is oppressed with irresistible drowsiness during the day, and troubled with want of sleep at night, or the sleep is disturbed by dreams and incubus. The uterine functions seldom escape the influence of this disorder; menstruation is generally deranged, being either painful, irregular, or deficient, and the secretion pale-coloured; leucorrhœa is a very common attendant of the complaint in early as well as in protracted cases. Frequently the patient complains of uneasy sensations about the heart, of a sense of fluttering, of violent palpitation or syncope. The organs of respiration often suffer in consequence of this disorder; hence dyspnœa, short dry cough, frequently moist humoral cough with a grey viscid expectoration, or pain and sense of weakness of some part of the chest; in children a spurious form of croup is one of the most common symptomatic affections. The nervous system is often the chief seat of disorder, and chorea one of its most common forms; sometimes it affects the whole body, less often only one half the body, generally the right, and on some occasions only one of the extremities, very commonly the right arm. Paralysis, generally partial, affecting one, seldom more, of the limbs, is another form of secondary affection. Painful local affections are often the chief subject of complaint, rheumatic paralysis, rheumatic gout. *Erysipelas*, *erythema*, *acne*, and *impetigo*, are the most common affections of the skin which originate in this disorder.

The unfavourable progress of the disease leads to a state of general cachexy, *cachexia pituitosa*, which sometimes terminates in anasarca.

Pathology.—This species of dyspepsia, noticed by some of the ancient physicians, has been more frequently concealed under the name and description of other disorders. Overshadowed by the secondary affections which originate in it, it is only to be found masked under the symptomatic forms of other diseases. But the morbid products of the mucous secretion have scarcely escaped the observation of any practical physician. Marcard (Description de Pyrmont, vol. iii. pp. 45, 90,) and Stoll (Ratio medendi, p. ii. pp. 319, 346,) have particularly described them; Theden (Remarques et Expériences, vol. ii.,) and Hoffmann (Med. Ration. vol. v. de morb. infant. Obs. ix.,) have considered them as not an unfrequent cause of sudden death; Bonnet, Morgagni, Vesalius, Brunner, and other pathologists worthy of every confidence, have discovered them in the dead subject; and the minuter researches of modern anatomy have traced them to their proper origin. But this morbid condition of body never received its due share of importance until the work of Kämpf, (Abhandlung von einer nuen Methode die hartnäckigsten Krankheiten, die ihren Sitz im Unterleibe haben, zu heilen, 1784,) a Dutch physician, by whom it was first professedly described under the name of *infarctus*, and who must be considered to have established it as a particular disease. Though this author was in some degree guilty of the common error of most original thinkers, of overstepping and overcharging his premises,—for he said he recollected few diseases which were not originally referable to infarctus,—it was not so much this fault as his singular method of cure, which failed to lead to a more general reception of his opinions, which, except in Germany and Holland, have been too little attended to. In our own country, as far as we are aware, the pathological condition of this disorder has never been accurately specified, though the secondary forms of diseases under which it masks itself have been frequently described. A few interesting cases of the primary disorder have been given by Dr. G. D. Yeats, (Op. citat.,) but more particularly by Dr. Powell. (On certain Painful Affections of the Intestinal Canal, Med. Transact. vol. vi.)

It has been observed by those who have devoted much attention to morbid anatomy, (*Andral*, Anat. Path.) that the mucous glands of Peyer and the follicles of Brunner do occasionally present appearances very different from that of the healthy state. Sometimes they are found unusually developed; as large as mustard seeds; frequently they contain a whitish concrete matter, more or less friable, bearing a close resemblance to the caseous or lardaceous matter of tubercles; at other times a great number of small white bodies are found disseminated over the surface of the intestines, corresponding to the grub or *emphragma sebaceum* of the skin; for they are nothing more than the follicles filled with concrete mucus. These bodies occasionally acquire considerable size, but seldom exceed that of a pea; sometimes they are elongated, projecting in the form of little excrescences or fungous papillæ; or on the contrary, the follicles are flattened and depressed, with their orifice more or less apparent, from which is thrown out a thin greyish mucus, which sometimes collects in astonishing quantities in particular parts of the intestinal canal, or, spreading itself in every direction, forms a thick mucous coat over a considerable part of the surface of the intestine, which on the first view might easily be mistaken for the mucous membrane itself, in a white and healthy state; sometimes it is a tenacious mucus of a dark brown colour; or instead of this greyish semi-transparent semi-fluid mucus, a concrete matter, equally secreted by the follicles, may spread itself in the form of a membrane, more or less dense, over the surface of the intestinal canal; or instead of being spread on the surface, this concrete matter may form solid masses, as occurred to the celebrated Justin Lipsius, who, though treated by his friend and colleague Heurnius, suffered for a long time from this complaint, and was not relieved till he had voided a viscid mass of the colour and form of the intestines.

It was the doctrine of the school of pathology just disappearing, to consider all these morbid appearances as the result of inflammation of the mucous surfaces. Dr. Parry observes that the appearance of the fibrous and curdled stools of children, and the consistent concrete membranes taking on the tubular form of the intestines in adults, which are often evacuated from the bowels in slight inflammatory affections of the mucous membrane of the colon and rectum, so often mistaken for worms, consist rather of coagulated albumen than of concrete mucus; but there does not appear any just reason for this opinion. We have observed these without the remotest sign of inflammation; nor did Dr. Powell observe any, but on the contrary, states that the most remarkable circumstance in the history of his cases was, the production of an effect usually ascribed to inflammatory action without its previous existence.

There will be little difficulty in understanding how all the various symptoms and sufferings described as originating in this morbid condition of the mucous follicles may be consequences of it, if we allow a due importance to these organs in preserving a healthy action of the membrane of which they constitute so essential a part. On comparing the various morbid appearances presented by a disordered state of the follicles, we may remark that they divide themselves into two classes; one in which the secretion is suppressed or retained, and another in which it is excessive or overflows, to each of which opposite states a more precise observation will in all probability ascribe its appropriate symptoms. In the mean time it may be easy to conjecture how the mucous membrane, not defended by its appropriate secretion, may acquire a preternatural sensibility and irritability which, not only disturbing the function of digestion, and giving rise to most painful affections of the intestinal canal, but rousing the actions of its sympathetic organs, may induce any of the disorders which we have noticed; and how, on the other hand, the membranes, sheathed and muffled by the morbid envelope, and thus deprived of their sensibility, will induce disorder and excite sympathies of another character, and will also sometimes become mechanical causes of irritation and obstruction. The inconvenience of a dirty skin, as a writer on this subject observes, is felt, because its obstructed pores prevent the transmission of that insensible perspiration which is essential to health; languor, sickness, headach, and other inconveniences originate precisely in the same manner, from filthy intestines. And we know that the mucous membrane, either by sympathy or association, sometimes degenerates into a state relatively similar to that of the teguments of the surface of the body, which sometimes become hard, harsh, and rough; or glossy, smooth, and shining, like parchment; pale, weak, and withered, or covered with large thick scales of cuticle adhering to its surface, thus losing all its permeability; or, on the other hand, besmeared with an excess of sebaceous secretion, covering the skin with an oily, greasy, or waxy coating. When both these secreting surfaces, the skin and the mucous membranes, cease at the same time to perform their offices, it is not difficult to understand how the fluids become disordered, how nutrition becomes impeded, and how the most inveterate forms of cachectic complaints ensue.

Our pathology of this complaint receives considerable illustration and confirmation from considering its causes. It has been observed most frequently in females and children, in whom the mucous follicles are most developed; it prevails most in cold humid seasons, in cold humid climates, and therefore, prepared by the influence of winter, it often declares itself in early spring, and on the return of cold in autumn. Sedentary employment in confined and impure air, with neglect of personal cleanliness, are the circumstances most powerful in producing it; to which may be added unwholesome food. When the predisposing causes have been in operation, it is generally immediately excited by colds, errors of diet, drastic purgatives, fatigue, watching, anxiety, alarm, and bodily accidents. Constipation of the bowels, while it is a consequence, is also one of the exciting causes of this disease.

Method of Treatment.—The indications for directing us in the cure of this disease, are, 1, to render the function of digestion easy of performance by a proper selection of food, by preserving an open state of the bowels, and by proper exercise; and, 2, by endeavouring to correct the morbid condition of the follicles, which constitutes the proximate cause of the disease.

1. Having already so fully and so frequently considered the means of fulfilling the first indication, it will be unnecessary again to recur to that subject; we shall, therefore, content ourselves with referring to the treatment of *follicular gastric dyspepsia*, and shall for the present confine our observations to the means of fulfilling the second indication.

2. Some medicines appear to exert a particular influence upon the functions of the mucous follicles. According to our experience they consist of purgatives, especially rhubarb, senna, scammony, and aloes, of sulphurous and some neutral salts, as sal polychrest, muriate of soda, of alkalies, mercurials, chalybeates, of iodine, colchicum, gum ammoniacum, and ipecacuanha. Amongst several means capable of effecting the same object, it is a received principle of physic to select those whose operations are best known and most under control, having recourse to others only when their use cannot be dispensed with. Accordingly, some of the purgatives above enumerated, either alone or in combination, form the proper remedy of this complaint in milder cases; and where no signs are present indicating an inflammatory or excited state of the mucous membranes, rhubarb, with sal polychrest and a small proportion of ginger, the pulvis scammoniæ compos., the infusion of senna; in cold habits, the vinum aloes, the decoct. aloes comp., and the baûme de vie, are convenient combinations. Dr. Powell found, in his cases, that the infus. sennæ with the infus. gentian, comp., and from x to xx minims of liquor potassæ, repeated so as to produce four or more stools in the twenty-four hours, discharged the flakes of mucus better than saline aperients, and more efficaciously than mercurials. Where there were general torpor or coldness of the system with much pale urine, and dark stools with much mucus, Dr. Yeats observed very excellent effects from taking one drachm of the vinum aloes with xv minims of liquor potassæ in a little infusion of chamomile every morning. It is not enough that these medicines be taken in isolated doses. To give them effect, they must be steadily persevered in for some time. But their effects must be watched. If they cause irritation, heat, thirst, or much griping, they are not indicated, and may induce the very state we are seeking to remove. The largest fistulous membranes that we ever recollect to have seen discharged by stool, we observed in two ladies who were in the habit of using the electuary of senna every day as an aperient.

The operation of purgatives is rendered much more efficient when the bowels are prepared for their action by one or two small doses of alteratives. Of these the most certain and most manageable are mercurials, and we believe calomel to be the best form of this medicine. One, two, or three grain doses are generally sufficient, and, according to the state of the patient's stomach, it may be combined with the pil. galban. comp., the pil. scillæ comp., with a little prepared chalk if there be a disposition to diarrhœa, or with a minute quantity of opium or opiate confection.

Chalybeates, though in a less degree, possess the same alterative power over the follicles as mercurials, and united with their tonic properties, afford a means of cure applicable to another combination of circumstances; as for instance, when there exists a general torpor and coldness of the system, with much pale urine; when the patient is thin, pale, and weak, with a withered look, a peculiar dry state of the skin, and a small weak pulse, the appetite variable and capricious, the bowels slow, though easily regulated, and the evacuations always of a remarkably dark colour, like mahogany, or almost black; or when the patient is pale, bloated, and chlorotic; in all such cases chalybeates are very useful remedies. The most suitable preparations are the sulph. ferri combined with pulv. aloes; the ferrum tartarizatum or ammoniatum with rhubarb, or the carbonas ferri with rhubarb and soda. It has been observed in these cases, contrary to what happens in general, that chalybeates, instead of rendering the fæces darker, restore them to their natural colour, an observation which is in accordance with the experience of Nehr and Heidler, of the action of the mineral water of Marienbad.

Kämpf's method consisted in injecting frequent small enemata of strong decoctions of plants which he supposed to be endowed with resolving powers, as *taraxacum*, *saponaria*, *melitotus*, and such like; these he allowed to be absorbed from the intestines.

It is always desirable, as far as the case admits, to combine some tonic with the corrective treatment, and, as soon as the evacuations have assumed a healthy appearance, it may always be attempted. Chalybeates, as already observed, answer this purpose best; but when they are not admissible, or after their use, tar-water, lime-water, infusion of cascarilla, nitric or nitro-muriatic, or muriatic acids, are very useful remedies.

It is unnecessary to observe that this direct method of cure must be assisted by all those means which tend to the improvement of the general health, and which at the same time correct and avoid those habits which form the predisposing causes of the disease. Amongst these the state of the skin deserves particular attention. The warm sea-water bath, the cold sea-bath, the cold shower-bath, cold sponging with vinegar and water, or salt and water, friction with a flannel glove, warm clothing, preserving the feet dry and warm, will be found most useful auxiliaries.

But a remedy superior to any or even all of these, we have found in mineral waters, by which every intention of the medical treatment, corrective as well as tonic, we have seen more efficiently, more fully, and more surely accomplished than by any other combination of remedies. Some of the most surprising cures effected by mineral waters have been chiefly in affections of this nature, as has been observed at Carlsbad by Becher, at Marienbad by Heidler, in the waters of the Pyrenees by Bordeu, at Pyrmont by Marcard, and also at Eger and Harrowgate.

III. COLONIC DYSPEPSIA.

The functions of the large intestines being chiefly disordered.

Alvine excretion forms so important a part of the function of digestion, that, in common language, the term indigestion is exclusively appropriated to the disorder of that function; and if it be impeded, interrupted, or otherwise deranged, it is rare that its other processes continue to be healthily performed. There may be some exceptions to this, as in the extreme cases mentioned by Heberden, where one person was in the habit of having his bowels relieved only once every month, and another person twelve times every day, yet both with the enjoyment of perfect health; and in all persons, what is called the regularity of the bowels admits a certain latitude; but in ordinary circumstances the right performance of excretion is so essential to the health of the whole function of digestion, that any serious or long-continued irregularity of the bowels invariably leads to its disorder. We cannot, therefore, be said to have exceeded the limits of our definition in considering disorders of the functions of the large intestines as constituting species of dyspepsia.

The large intestines are very frequently, indeed most frequently, the part of the apparatus of digestion of which the functions are the first disordered; and the symptoms of their disorder often present the first perceptible link of the chain of the disorder of the whole apparatus; and though ultimately their disorder necessarily involves the whole apparatus, their derangement may so entirely predominate, that the healthy or unhealthy state of the other processes follows as a mere consequence of the state of the large intestines.

The disordered functions of the large intestines, considered only in reference to the part which they perform in digestion, without regard to the more positive diseases of which they may be the seat, are of themselves a source of great discomfort to the patient; but they deserve most consideration as being the medium through which the greater number of the disorders of the function of digestion become established, not only directly, by the impediment which they present to the function of the stomach and small intestines, but indirectly, by the stomach being made the recipient of the medicines which are necessary for their relief. The disordered function of the large intestines may, therefore, be considered as the means by which most of the noxious causes which disturb the healthy function of digestion produce their effect, and the principal secondary cause by which they extend their mischievous consequences.

The disordered functions of the large intestines afford almost the first symptoms of the derangements of the stomach and small intestines, which attract the attention of the patient, and have not seldom been improperly treated as a dyspeptic state of the stomach itself. This, as Dr. G. D. Yeats very justly observes, is not remarkable, it being recollected that the great arch of the colon lies close upon the stomach, whence a swelling or puffiness in the one may easily, without due care, be attributed to the other.

As long as the disorders of the large intestines continue to predominate over the disorders of the other parts concerned in the function of digestion, they have their own symptoms, and demand their own method of cure. When they have induced the disorder of the whole function, it is always important to know where the error originated; and as their disorders may be mistaken for those of other organs, it is necessary that a distinction should be made between them. Under every consideration, as the disorders of the functions of the large intestines admit of being ascertained, so they deserve being made a subject of special attention.

Like the other organs of the apparatus of digestion, the large intestines may be deranged in different ways; they may be disordered from atony, from morbid irritability, from inflammation of their mucous membrane, from disorder of its follicles;

all which morbid conditions afford the means of dividing colonic dyspepsia into a corresponding number of species.

I.—Atonic Colonic Dyspepsia.

Synonyms.—Obstipatio debilium, *Cullen*; mimoses; acute disorder of the general health; *Marshall Hall*; cœliacus affectus, *Celsus*; colica stercorea, *Etmuller*; colica flatulenta, *Sennertus*; lien verberans, *Bonetus*; stridulous affection of the bowels, *Bradlye*; (Observations on a Stridulous affection of the bowels, London, 1818,) tenesmus à scybalis; dysodia stomachalis, *Sauvages*; excrementitious plethora, *Barlow*.

General Character.—Bowels habitually confined, but alvine evacuations not remarkably altered; pain or uneasiness in some part of the colon, variable in degree, situation, and constancy; often stridulous noise in the abdomen. [See Colon, Torpor of the.]

Though costiveness is the leading symptom of this disease, it would be a mistake to suppose that it consisted in costiveness alone, or that constipation of the bowels was the only symptom which an atonic state of the colon gave rise to.

Form of Disease.—This disease is not confined exclusively to either sex; it is most common in young females, and in delicate boys or young men. After there has existed for some time an habitually confined state of bowels, or a morbid state of them, in which, though evacuations occur daily, they are scanty and insufficient, the patient appears slowly and imperceptibly to fall out of health; but it is some time—several months, even years—before his ailments attract serious attention. The patient has no marked or distinct complaint, but the appetite is impaired, there is lassitude, loss of strength, weariness after any bodily exertion, a general, sometimes painful feeling of weakness, an aching over the whole body, or very distressing pains in the loins and lower extremities, attended with some degree of torpor, especially on walking or long standing; and hence the patient is constantly constrained to sit down or to rest on a sofa. There is frequent headach, great nervousness or susceptibility of impression, a tendency to perspiration on the least surprise or exertion, fluttering, faintishness, timidity, discomposure by the least hurry or agitation, sometimes tremor and vertigo. At first there is no loss of flesh, but the skin grows coarse, the countenance puffed and bloated, the complexion dull, foul, and greasy, and the lower eyelid becomes dark, sallow, or otherwise discoloured. But as the disease continues, there is considerable loss of flesh, the complexion loses its colour and turns pale, sometimes dead-pale, sometimes swarthy pale, sometimes rather chlorotic; the countenance becomes thin, the features sharp, and the lips, more especially the upper lip, are sensibly paler than any other part of the face; the surface of the face is somewhat shining and glossy, or is frequently affected with a slight degree of clammy or oily perspiration, especially about the nose; and the orifices of the sebaceous follicles appear as small black points disseminated over the surface; and the discoloration under the eye increases to sallowness or a greenish black colour.

Pain is frequently complained of in some part of the colon, which, when it exists in an aggravated form, is various and irregular in its situation, course, degree, and duration; its approach is sometimes sudden, often slow and progressive; at first it is apt to change its situation from one side to the other, or from one part of the colon to another, and frequently appears to move up the chest or to the back, but by degrees it becomes more permanent in its situation; it is commonly observed in one of the iliac regions, frequently in the right iliac region in the course of the ascending colon, in which situation the pain on some occasions becomes very acute, aggravated by violent spasms returning in paroxysms, and not rarely attended by vomiting and great irritability of stomach, (the *colica stercorea* of some authors,) often the forerunner of stercoraceous tumours, and ultimately of that disease which has been described by Dupuytren under the name of phlegmonous tumours of the right iliac region, and which has been recently well described by Mr. Ferral. (Edin. Med. and Surg. Journal, 1831.) A common situation of the pain is in the left side just under the false ribs, and very often in the left iliac region in the course of the sigmoid flexure of the colon; in this last situation it is occasionally attended with a frequent desire to go to stool, accompanied with distressing tenesmus. Frequent though ineffectual efforts are made to obtain a stool for several days, and at length a number of small hardened and slimy lumps, or scybala, either separately or connected together, similar to sheep's dung, more rarely of a flattened or tape-like form, will be voided, sometimes preceded and sometimes succeeded by liquid and sanious stools of various colours and of a frothy consistence, always extremely offensive. This is the *tenesmus à scybalis* of some authors, and the dysentery of others, of which inflammation and ultimately ulceration of the mucous membrane, and occasionally stricture of the lower part of the colon, are the remote consequences. On some occasions the pain and soreness is felt about the middle and lower part of the hypogastrium; and a slight pain is also experienced on micturition. Sometimes there may be perceived in the course of the colon a distinct hardness or tumour, which appears to arise from a loaded state of the intestine, an occurrence particularly apt to take place in females, and more especially in the left iliac region. When the disease has made some progress, the hypogastrium is generally swollen, especially in the evening and fore part of the night, but in the morning the enlargement has nearly or altogether vanished, in some cases leaving a degree of soreness in that region.

One of the most common and most distressing, as well as unpleasant attendants of this complaint is a disagreeable noise, not unlike the croaking of a frog, heard in the bowels, proceeding more especially from the left side. The noise is very much under the influence of respiration, and also any state of excitement. For the most part, especially on inspiration, it is similar to the croaking of a frog; but on expiration it is somewhat less so, conveying the idea of the sound issuing, as it were, from water; often before it ceases, it is like the plaintive sound of a dying animal. *Dicitur gemere de turture*, τρίζειν τρύζειν. At every act of inspiration, on laying the hand on the left umbilical region, about two inches or two inches and a half from the navel, in a transverse direction towards the spine of the ilium, a sensation is felt as if some liquid were forcibly spirted or dashed against the peritoneum; on expiration this is less perceptible. This curious verberation is not always confined to the same part of the abdomen, as it will often be found two and a half or three inches from the navel in the direction of the spleen. During its presence the patient seldom complains either of pain in the part or on any moderate pressure, or even from change of posture; but if the part be suddenly pushed by a moderate force, great pain is often felt in the region of the stomach, so much as to cause fainting, a circumstance which more particularly happens when the pulsation approaches the epigastrium. At first this stridulous noise returns at uncertain intervals in the course of the day, and is of no limited duration. The period of its continuance, however, seldom exceeds twenty minutes or half an hour; it is particularly marked whilst the patient is in an erect posture; on lying down it will almost instantly cease, and be no more heard as long as the body continues in an horizontal posture. Whatever is taken into the stomach, whilst the body is erect, has no inconsiderable influence in exciting or abating this stridulous sound. For instance, after the patient has sat down to a meal and taken a few mouthfuls, it will almost invariably ensue, and continue for some time, after which it becomes weaker, and intermits more and more until it ceases. In other cases, however, instead of food producing this effect, it oftener abates this noise, especially when the stomach is empty, and there is faintness and a sense of craving for food. In the advanced stage of the complaint, the noise frequently returns, even while the patient remains in the horizontal position. The varied state of the bowels seems to have little influence either in augmenting or diminishing the noise in the abdomen.

If the state of the organic functions be inquired into, they will be found to betray a considerable deviation from the state of health. The appetite is generally impaired, sometimes to loathing, but frequently without any symptom of gastric or duodenal dyspepsia; sometimes there is remarkable irritability of the stomach, the patient throwing up part of the little nourishment taken immediately on swallowing it; and this vomiting is often attended with pain or uneasiness in, or tightness across, the stomach; sometimes there is faintness with a sense of craving for food. The tongue always presents an unhealthy appearance, almost invariably it is loaded or covered with a white slimy fur; sometimes it will be found coated with a whitish fur, inclining to a yellowish tinge, and often dappled towards the root, especially of a morning; occasionally for a few days this incrustation is diminished, and the patient is more disposed for food, but this change is of short duration. Frequently the tongue is loaded, swollen, and œdematous, and marked by pressure against the contiguous teeth; it is frequently so large in proportion to the mouth, that from compression it is found more or less divided with sulci or folded into plaits. The teeth and mouth are foul; the gums also are frequently coated and palish; the inside of the cheeks, like the tongue, is often impressed by pressure against the teeth; a vitiated taste is sometimes perceived, particularly in the morning; the saliva is viscid, the breath tainted and fetid, sometimes emitting a heavy strong smell, not unlike roasted meat, sometimes a putrid, even stercoraceous odour. The bowels are at first always constipated, afterwards constipation and diarrhœa occasionally alternate; in advanced cases the latter state becomes permanent. The fæces at first exhibit in general no unnatural appearance, except that they are scanty and indurated; afterwards they are occasionally fluid, scanty, dark-coloured, and extremely fetid, often accompanied with mucous and even blood; sometimes, as already observed, they are attended with tenesmus, bloody stools, and pain in the right iliac region, an occurrence very common in young females. In the commencement the urine is high-coloured and apt to be loaded, depositing a whitish sediment, and presenting a supernatant iridescent pellicle; afterwards it lets fall a mucous deposit, sometimes of a lateritious tinge; during the continuance of the disease the urine frequently becomes limpid, but slight exasperations of the complaint restore the deposit. The pulse is frequently nearly natural; sometimes it is quick or easily accelerated, or variable, and apt to become irregular and intermitting; it is usually soft and weak, sometimes small; it varies in point of fulness, and continues to increase slowly in frequency as the complaint advances. The skin is in general cool, rather moist and clammy, particularly the hands and feet, which are apt to be obstinately cold; the fingers are rather livid, and the nails assume a lilac hue.

It is remarked by Dr. M. Hall, from whose exact portrait of this complaint we have drawn a considerable part of our description of it, that the condition of the countenance, the tongue, internal mouth, and general surface, is peculiarly constant and uniform in almost every case and every period of the disease, but that the other symptoms are characteristically inconstant and variable.

These symptoms are—an unaccountable sensation of weakness and weariness, the patient suffering from a sense of aching after slight exertion; a considerable loss of strength, sometimes amounting to faintishness in the upright posture, with a peculiar sense of fluttering at the heart and pit of the stomach; but the most frequent subjects of complaint are headach, vertigo, and nervousness. The headach, which is severe on rising from bed in the morning, insomuch so as sometimes to excite vomiting, will continue unabated for an hour or two, and is often proportionate to the degree and length of time which the patient has slept. The patient is flurried by the least hurry, agitation, or excitement, is very frequently affected with nervous tremour on the least surprise or least exertion, frequently manifested in a quivering of the lip or dimpling of the chin on speaking; or, when at all agitated, by tremour on holding out the hand, or carrying a cup of tea to the mouth, on attempting to stand or walk, or on being fatigued or hurried. Sometimes there is oppression, heavy sleep, or considerable stupor or obtuseness of intellect during the day, and during the night great wakefulness and restlessness, disturbed sleep, dreams, and incubus.

The patient is liable to violent and sudden attacks, generally induced by some improper article of diet, or a more than usually loaded state of the large intestines, such as sickness, vertigo, faintishness with cold perspirations, paleness of the countenance, and coldness of the extremities. These attacks are sometimes accompanied with spasmodic or convulsive paroxysms, frequently assuming the form of hysteria, more rarely of epilepsy, and occasional temporary delirium, loss of memory, or absence of mind. Sometimes the attacks consist of spasmodic or anomalous pains about the heart or side, or in various parts of the abdomen; in fluttering, irregular action, violent palpitation of the heart, with syncope; in local pains more or less severe, occasionally so severe as to resemble tic douloureux, of longer or shorter duration, and in various forms and situations; in some cases resembling the passage of gall-stones, in others inflammation of the pleura, of the liver, spleen, kidneys, and intestines or peritoneum, and affections of the bladder. Sometimes there is an extraordinary loss of muscular power, especially of the lower extremities, which are so enfeebled as to appear affected with paralysis.

Curvature of the spine is not a rare complication and consequence of this disease, more especially in scrofulous constitutions. Its approach is very gradual, and long before any deformity can be observed, on forcibly pressing with the fingers on each side of the spinous processes of the third or fourth lumbar vertebra, considerable pain will generally be excited, insomuch as occasionally to produce a degree of sickness. The seat of this pain is, however, confined to no exact point. After a considerable time the patient experiences a further increase of weakness and derangement of the general health, and the spine, at the place above mentioned, will now be found giving way, either slightly projecting anteriorly or to the left side. In consequence of the curvature of the spine to the left side, the right hip has the appearance of being enlarged, by reason of the hollowness between the iliac and vertebral column being increased, whilst the left hypogastric region is more swollen than the right.

Dr. Bradley conceives that the disease of the spine is the primary affection, of which the stridulous sound and other derangements are only the consequences. We confess that to us his reasoning presents a very remarkable instance of a false induction; for on his own admission there is no constancy of conjunction between the affection of the spine and the stridulous noise, as every practitioner must be able to confirm. They are both accidents of a more general disorder, only connected together through their common cause.

Causes.—A certain period of life, from the age of ten to thirty, seems very much to favour the formation of this disease. It may be partly connected with the natural conformation of the body and the development of the constitution at this particular time of life; but perhaps it is more strictly dependent upon the change of habits coincident with it in the children of the rich, who are either unremittingly occupied with their omnifarious education, or, to obtain a graceful carriage, steadfastly confined to one posture, the undeviating sedentariness of the body presenting a remarkable contrast to the desultory activity of the mind; and in the children of the poor, who are of necessity obliged to seek their bread in the sedentary occupations of needle-work, in the tedium and wearisomeness of manufactories, at the tambour, the stocking or the lace-frame. Hence females, who are under boarding-school discipline, and rigidly subject to it, being compelled to sit many hours of the day with the head erect and the shoulders thrown forward, are liable to this disease; hence governesses, sempstresses, milliners, mantua-makers, students, and all persons of sedentary and inactive occupations, are the chief sufferers from it. The effect of sedentariness is increased by any causes which have a relaxing influence upon the body; and hence the confined or impure air of apartments, the warm relaxing vapoury air of some occupations, as that which arises from working over ironing-stoves, or from the steam-engines of manufactories. But every circumstance which tends in any way directly or indirectly to impede the evacuation of the bowels is the most influential cause of this complaint. Hence not lending a ready obedience to the calls of nature, which often arises in children from indolence of habit, but more frequently from being placed in situations where their modesty checks them in doing so, and, at a later period of life, from the unbending restraint and thraldom of society; or amid the fatigue, care, and anxiety of life, from neglecting a due attention to the state of the body.

Pathology.—The explanation of the nature of this disease presents no difficulty. That it consists in a state of atony and insensibility of the colon, the most probable consequence of habitual over-distension of its muscular fibres, there seems to be little reason to doubt. The symptoms may be clearly and distinctly traced to this morbid condition of the colon, with which also it seems easy to connect the disorder of the general health which ensues. For, sometimes by continuity, sometimes by sympathy, deranging the function of gastric and duodenal digestion, sometimes by defective excretion changing the state of the circulating fluid and interfering with the process of nutrition, sometimes by the sympathetic irritation of distension disturbing the functions of the nervous system, and by pressure impeding the circulation in the abdomen, (from which cause and continuity, the functions of the womb and pelvic viscera become disordered, and the spine loses the support of the antagonist muscles,) it seems all-sufficient for the effects which we attribute to it.

When the disorder of the colon is secondary, supervening upon gastric or duodenal dyspepsia, it appears to be merely a degree of languor or sluggishness in the bowel, causing delay in the passage of its contents, the consequence of the bile and other secretions being less adapted to support its action; but when its contents are longer delayed than usual, they become hardened, and irritate the surface of the intestine, causing tenderness on pressure, a feeling of hardness in the part, and all the symptoms of colonic disorder already described.

Treatment.—The indications for directing the method of cure are, *a.* to remove any accumulation of fæces by having the bowels fully and satisfactorily evacuated; *b.* to facilitate and promote the regular performance of the function of the colon; and, *c.* to correct the morbid condition of the colon, the proximate cause of the disease.

a. For fulfilling this indication, purgatives cannot be dispensed with; but though constipation is a constant attendant of this disease, they are not to be given with an unsparing hand. Rhubarb, combined with sal polychrest and a little ginger, the pulvis scammoniæ comp. followed at a proper interval, if necessary, by a little infusion of senna, are the best description of purgatives. If the bowels are not easily acted upon, it is a bad practice to continue throwing in without discrimination any description of purgatives without allowing sufficient time for moderate doses to act. Mercurials are unnecessary unless the alvine evacuation does not resume its proper colour by means of the other class of aperients.

b. This indication may be fulfilled by the daily use of the warm water lavement, and, if necessary, by some mild aperient medicines, just sufficient to solicit the bowels without irritating them. The object should be to induce a full and consistent evacuation daily, avoiding as much as possible the fretting and painful operation of medicines, by which the bowels are irritated. On the other hand, the power of the aperient must not be less than equal to obtaining a complete evacuation of the bowels; scanty evacuations will not suffice. Whilst, therefore, too considerable and too often repeated doses of medicines are to be guarded against, ineffectual medicines are equally to be avoided. Good forms of aperients are the pulv. aloes comp., decoct. aloes comp., or baûme de vie in pimento water; a pill composed of equal parts of ext. colocynth. comp. and extract. hyoscyami: three, four, or five grains of this composition may be occasionally taken. The following formula affords a useful pill:—R. pulv. aloes, pulv. gambog. saponis, ext. hyoscyami āāʒi. fiant pilulæ xx. Una vel duæ horâ somni sum.

Though the use of the warm water injections in the loaded state of the bowels is frequently attended with pain in the course of the colon, or though they may not be at first successful, yet a perseverance in their use generally overcomes these obstacles, and occasionally restores the natural and spontaneous action of the bowels: by preventing the constant distension by accumulated fæces, the opportunity is afforded the intestine of resuming its tone and sensibility. But whether clysmata or aperients are used for relieving the bowels, opportunity should be from time to time afforded for their natural action, by leaving off, or gradually diminishing, the medicines.

The diet should be mild, light, and nutritious, taken in moderate quantities, and frequently not less than three or four small meals daily, for the frequency of the meal appears to have a considerable effect in promoting the action of the bowels. It should consist of mild animal food, boiled or roasted, and should be well masticated; mutton, chicken, beef less frequently; stale pure bread, untoasted, mealy potatoes mashed, tea or coffee in moderate quantities. We have not known much advantage from using more aperient kinds of food, as fruits, figs, medlars, stewed plums, stewed apples, brown bread, oatmeal porridge, and such-like. They generally disorder the first processes of digestion.

The function of the bowels will be also promoted by a system of regular walking exercise, apportioned to the strength; but violent efforts and fatigue are injurious. Sometimes easy, lounging exercise, with complete relaxation of mind, has considerable effect in promoting the evacuation of the bowels.

c. The means of fulfilling this indication are partly direct, partly indirect.

1. When the bowels have been preserved in a soluble state, the use of tonics or chalybeates may be advisable for correcting the morbid condition of the bowels. When chalybeates have a tendency to keep the bowels open without causing griping, they are often of great service, and we have had frequent opportunities of observing the superiority of the chalybeate mineral waters in this respect over the officinal chalybeates. But the state of the tongue must always be the guide for administering tonics, for as long as this is considerably furred, the most effectual means for removing such fur will prove the best tonic, and the utility of any tonic may be estimated by the return of appetite; therefore any stomachic tonic which does not effect its purpose by removing the fur is injurious.

Friction over the bowels with the flannel glove or flesh-brush, the galvanic circuit passed through the bowels and daily repeated, and in obstinate cases an occasional blister, are also direct means having the same effect in different degrees. But of all external means we have known the greatest service from the warm or cold douche upon the abdomen, continued for a month or six weeks, as so commonly practised in Italy.

2. The indirect means are sea-bathing, sponging the body with salt water or vinegar and water cold; change of air; country air; travelling; warm clothing; preserving the feet dry; relaxation from study, occupation, and business.

II.—INFLAMMATORY COLONIC DYSPEPSIA.

Synonyms.—κοιλιακὴ, *Græcorum;* ventriculosa passio, *Cæl, Aurel.;* enteritis colica, colica phlogistica, *Sauvages.*

General Character.—Pain in some part of the colon, prevailing most in one particular point, felt always more before an evacuation of the bowels, seldom increased on pressure; stools generally liquid, rarely formed, not always more frequent than natural.

Form of Disease.—We wish, without encroaching upon the subject of diarrhœa or dysentery, to characterize by this term a disorder of the function of excretion, arising from chronic or subacute inflammation of the colon. This complaint is manifested by pain in some part of the colon, and by sense of extreme weakness or of fainting after an evacuation of the bowels. The patient is always remarkably lowered, irritated, or made otherwise uncomfortable by the action of purgative medicine, and even by the spontaneous action of the bowels, which is always followed by more or less feeling of exhaustion; he feels always most strong and most comfortable when his bowels are confined. Sometimes the pain or uneasiness extends over the whole abdomen, and there is also a certain degree of tenderness and an increased heat of the part; but more commonly the pain is referred to particular points of the colon, to which it is more or less confined—frequently to the caput cœcum coli and the ascending colon; sometimes to the arch of the colon; in young women to the sigmoid flexure. The pains of the colon are accompanied with a pulse somewhat accelerated and rather tense; there is some degree of thirst, but seldom much heat of surface. The motions present an unhealthy appearance; they are seldom formed, more commonly liquid or pultaceous; sometimes they are light-coloured, almost white, sometimes yellow and frothy, less frequently green or black; sometimes a tenacious puriform matter streaked with blood is discharged, which on some occasions alternates with healthy feculent matter, and at other times is mixed with it; the evacuations are always fetid in some degree, on some occasions most remarkably so. They are generally more frequent than natural, but often they are not so, an evacuation sometimes not occurring oftener than once in two days. The stools are frequently discharged with considerable force, but occasionally there is tenesmus without any excrementitous discharge. The appetite is seldom much impaired. The complexion is pale or whitish, sometimes of a remarkable greenish paleness, and the body emits more or less of a cadaverous smell.

The unfavourable progress of this disease is to hectic fever accompanied with œdema of the lower limbs and face, dejected features, and gradual exhaustion.

Causes.—This complaint is a common consequence of the preceding form of dyspepsia, more frequently of the medicines which have been improperly used for its cure; the effect of distension from remora of fæces, or of harsh drastic medicines. It is also on some occasions produced by the irritation of worms, and may arise from accidental colds.

Pathology.—The nature of this disease has been verified by repeated dissections, which have shown it to consist in various degrees of inflammation of the mucous membrane of the colon, sometimes very limited in extent, frequently terminating in ulceration, occasionally in thickening or induration.

Treatment.—Leeches or cupping to the painful parts used with caution and moderation; fomentations; covering the abdomen with a flannel roller moderately tight; light, bland, pultaceous diet; milk, if it is easily digested, or asses' milk; rest of body, sometimes confinement to bed or the recumbent posture, afford the only means of relief in this complaint.

III.—Irritable Colonic Dyspepsia.

Synonyms.—'Ερευγματώδης νοῦσος, *Hipp.*; colica hypochondriaca, hysterica, *Sydenham*; flatulentia hypochondriaca, hysterica, *Juncker*; flatulentia convulsiva, *Sennertus*; hypochondriasis tympanitica, *And.*; colique nerveuse; enteralgie, *French.*

General Character.—Intestinal digestion accompanied with pain, uneasiness in some part of the abdomen, seldom fixed to one spot, but changing its situation, and intermitting.

Form of Disease.—There exists a certain morbid condition of the intestines, referable only to irritability or morbid sensibility, without either proof or sign of an inflammatory state of the mucous membranes. It is certainly most frequently met with in persons of irritable and nervous temperaments, and is therefore probably a consequence of that constitutional state; but the symptoms show that this morbid condition is sometimes pre-eminently developed in the intestines, in which the patient is sometimes the subject of the most painful, distressing, and unnatural sensations. It is always attended with hypochondriasis, a constant watchfulness and attention to all bodily sensations, which depress and overwhelm the mind. These patients frequently complain of pain, or of a sensation of twisting at the umbilicus or in the course of the colon; occasionally of acute pain in the same situation, seldom augmented, generally relieved, by pressure; frequently a sensation of sinking or dragging of the bowels, giving the notion of the intestines falling out; some patients experience this uneasy feeling to such a degree that they are obliged to confine themselves to the recumbent posture. Sometimes, instead of pain, the patient feels in the intestines an indescribable uneasiness or peculiar sensation, similar to those which are perceived in the stomach in irritable gastric dyspepsia; occasionally the pain and preternatural sensation exist together, frequently they alternate with each other.

Frequently the chief subject of complaint in this disease is flatulence, which is generally accompanied with inodorous eructations, neither acid nor putrid, with stridulous noise in the bowels, borborygmi, with colic and spasmodic pains affecting different parts of the bowels, which are sometimes accompanied with ptyalism and copious discharges of limpid urine.

A very aggravated form of this complaint has been described under the term *flatulentia convulsiva.* It occurs in men, and has a strong affinity to the hysterical passion of females, the sexual organs being strongly affected. Early in our medical career we witnessed a case of this disease, the paroxysm of which a more experienced and now justly eminent physician arrested by the application of cold to the testicles.

The uneasy feelings in this disease return or are exasperated during the intestinal digestion, which is ordinarily difficult and laborious. They are frequently dissipated by travelling or agreeable occupation of the mind, and return with repose. They are sometimes, however, aggravated by the least motion, and are excited by a fit of passion, by anxiety of mind, by any disquietude, sometimes by the least effort of attention. The pains and colic often supervene upon stormy or unsettled weather. We recollect to have seen a case of this disease which co-existed with a remarkably painful sensibility of the retina.

Under these complaints the patient may preserve the appearance of health, and though the function of digestion is painful, it is yet satisfactorily performed, the nutrition being little affected, and the stools healthy, though the bowels are generally disposed to be confined.

Every form of this complaint is most obstinate, and rendered doubly so by the mutable and variable state of mind of the patient, who is contented with no method of treatment, and is every day changing his physician. He has not patience to wait for the operation of any medicine, but is unceasingly fretting his body with every description of medicine, particularly with aperients, by which his complaints are invariably aggravated.

Pathology.—Concerning the nature of this disease, we refer to our pathology of irritable gastric dyspepsia. Bonetus gives the case of a person who had this complaint, marked by great pain and rolling of the bowels, attended with a morning sibilous noise, for three years, in consequence of plum-stones lodging in the colon.

Treatment.—The cure of this disease, always difficult to be obtained, is to be sought for by a mild bland diet, easy of digestion. If milk diet agrees, the patient should confine himself to it. He should avoid any thing heating and irritating, and should shun every form of medicine as much as possible. The bowels are to be kept soluble by the easiest means. The patient should live much in the open air, and take exercise, chiefly on horseback. Sailing, and even long sea voyages are very useful. Of direct medicines we can speak most in favour of chalybeates, and the other metallic tonics. We have known the Kesselbrunnen of Ems of considerable service, but the worst case we have known was benefited by the artificial Pyrmont water.

IV.—FOLLICULAR COLONIC DYSPEPSIA.

Synonyms.—Colica pituitosa; (Sennerti species tertia; *Fernel.* pathol. lib. vi. cap. 9; *Salmuth.* centur. i. obs. 78. *Bonet.* Sepulchret. obs. 23;) scelotyrbe pituitosa; (*Pereywinger*;) chlorosis pituitosa; (*Sauvages*;) diarrhœa pituitosa, (*Id.*,) *Auct. Var.*; arthritis chlorotica, (*Musgrave*,) *Sauvages*; paraplexia rheumatica, *Id.*; infarctus, (*Etmuller*, p. 440,) *Kämpf.*; colique glaireuse, *French.*

General Character.—Pain, spasm, or uneasiness in the course of the colon, with the evacuations of considerable quantities of mucus in various morbid states.

Form of Disease.—In persons of sedentary habits, more frequently young persons, and most especially young females, who are generally subject to costiveness and accumulation of fæces in the large intestines, the mucous follicles of those organs are liable to be disordered in the way we have already explained in the section on *follicular duodenal dyspepsia*, much to the aggravation and obstinacy of the other symptoms. Like that complaint, the present disease is most usually met with in cold phlegmatic habits, and its progress is insidious. After habitual costiveness and the establishment of that state of general disorder of the health which we have already considered under *atonic colonic dyspepsia*, the patient becomes subject to acute attacks of pain or spasm in some part of the large intestines, frequently amounting to regular paroxysms of colic. The pain is occasionally confined to one particular part of the colon, frequently the ascending colon and the sigmoid flexure. Relief of these pains is only obtained by copious discharges of mucus in some of the various morbid forms already described. Etmuller has observed that the pain in this species of colic is more confined to one part of the abdomen, and conveys the feeling of a perforating or transfixing pain. But instead of this direct symptom of disorder, it is not unusual for the patient to be seized with a violent nervous affection. Children are frequently seized with convulsions, to which succeed chorea, and sometimes paralysis of the limbs. Young women in this complaint are often affected with hysteria, which may, however, be distinguished from the idiopathic form of that disease by the great variety of ways in which it attacks the patient, sometimes as catalepsy, at other times as imbecility of mind, neuralgic affections of the heart, convulsive asthma, loss of voice, loss of speech; it very frequently leaves paralysis of some member, most commonly of the lower limbs, differing from ordinary paralysis in the sensation of the limb being seldom impaired. Painful affections of the heart, violent headach, extreme restlessness and agitation, rheumatic gout, severe pain in some part of the spine, frequently at the bottom, may be enumerated amongst the secondary affections of this disease. In women the uterine functions are always painfully performed; and it is not unusual to see a metastasis of the function to other organs, to the lungs, appearing as hemoptysis; to the stomach, as hematemesis; to the bowels, as melæna. These derangements of the natural functions are various. Generally the patient becomes pale and delicate looking, but sometimes preserves a natural appearance, or even good looks; the skin is cool, moist, and clammy, particularly the extremities; the lips and gums are pale, and the tongue is invariably large, moist, and covered with a thin clammy coating; frequently it is swollen and œdematous, divided laterally or transversely by deep cuts or fissures, and retaining the impressions of the teeth. The bowels are always constipated, often obstinately so, the most violent medicines having little effect; but when they do act, the stools are found to be abundant, gruelly, and light-coloured, frequently deficient of their natural smell, or having a faint muskish smell, and, if mixed with water, leaving a greyish calcareous deposit: sometimes they are extremely fetid. Occasionally the stools are mixed with shreds of membranous substance, or with mucus in various morbid states and forms, frequently in perfect tubes, some of which have been observed full half a yard in length; an appearance which has not rarely imposed upon the ignorant the belief that a portion of the intestines has been actually discharged. The urine is extremely variable, being sometimes scanty and loaded, almost deficient, at other times copious and limpid like water. The pulse, except under the excitement of any violent attack, is always weak, small, and soft, generally slow; the circulation seems hardly to arrive at the system of the capillary vessels.

Pathology.—Under *follicular duodenal dyspepsia* we have already sufficiently inquired into the nature of the morbid condition of the mucous membranes which constitutes the proximate cause of this disease; a condition in which their surfaces are deprived both of their secreting and absorbing function as well as their natural sensibility, their vessels losing their permeability, and becoming, as it were, impacted and blocked up with viscid or concrete mucus—*emphragma mucosum.* This state is the consequence of the membranes, either from atony or inflammation, losing the power of throwing off the mucus from their surface, and which, either accumulating or concreting in the follicles, gives rise to considerable tumours there; or, collecting, forms itself into the various forms of excreted matters already noticed. This unhealthy state of the mucous membranes, the consequence of a depraved function of secretion, is the proximate cause of many painful, even dangerous diseases, arising as well from the disordered function of the membrane as from the irritation of such unnatural substances in the alimentary canal, inducing different symptoms corresponding with the different situations they may occupy. The most common cause of this state is the habitual costiveness of sedentary persons, or the repeated irritation of the alimentary canal by crude and indigestible articles of food; but we have known it to be produced quite independently of these, by the long-continued use of laxative medicines, and these by no means of the most irritating kind.

Treatment.—For the general treatment of this complaint we must refer to the corresponding form of duodenal dyspepsia. We have only to observe that, as a purgative for evacuating these *infarctus*, we have found the oleum terebinthinæ superior to any other.

IV. GASTRO-ENTERIC DYSPEPSIA.

The disorder affecting the function of more than one organ of the apparatus of digestion.

The preceding orders present dyspepsia in the simplest forms in which it is capable of existing, either such as it has been observed to assume, or to which it may be reduced by a careful classification of its causes, its symptoms, and its remedies. It is, however, neither pretended nor meant to be understood that it is met with always in these definite forms. In diseases there is nothing absolutely definite. They are not like animals or plants, each of which, nature, to preserve the integrity of the species, has surrounded with a distinct barrier. In strictness of language, diseases may be described, but cannot be defined. They pass so gradually into one another, that all the pathologist can hope to attain is to mark their leading and most constant phenomena. In describing the different forms under which dyspepsia presents itself, this is all that we have either sought or professed to do; and though we are too well aware that not only the species or forms of the different orders, but that even the species of the same order, may be complicated with each other, we venture to assert that, however intimately the different species may be combined together, it is seldom that one will not be found predominating. A knowledge, therefore, of the elementary forms of dyspepsia gives the physician a most commanding advantage even in cases the most complex; enables him to decompose and unravel their complications, furnishes him with indications which, as it were, throw daylight upon his operation, simplify and assure his method of procedure, and afford him the means, if not of foreseeing, most certainly of early descrying, the effect of his remedies.

The characters which we have assigned to the different species of dyspepsia, are the result to which we have been conducted by the review of many cases in which the disease has been presented in its most simple as well as its most complicated forms, comparing the circumstances of one case with those of another, separating the constant from the contingent, referring each to the morbid condition with which it was found to be most constantly conjoined. And if any persons should be disposed to regard these morbid conditions as mere figments, or to regard the terms which represent them as mere empty words, we trust they will be reasonable enough to recollect that the name does not change the thing, and that if it serves to mark the constancy of conjunction of a group of phenomena, it matters not which word or what sign we may use for the purpose.

Were time or space allowed us, it would be the object of the present section to indicate and describe the complications of the different forms of dyspepsia, to trace the law of their combinations, and the order in which they coexist or succeed each other; circumstances well deserving the attention of the physician. But this task we must reserve for another occasion, and content ourselves at present with merely indicating some of the more common complications. We leave the full consideration of this part of the subject with the less reluctance, because we are convinced that a moderate attention to the elementary forms of this disease will render a description of their complications almost superfluous.

When the disorder of the function of digestion extends to the whole or to more than one organ of the apparatus—to the stomach as well as the intestines, the morbid condition may be the same throughout, or it may be dissimilar, thus giving rise to the division of *gastro-enteric dyspepsia* into what may be termed *enopathic* and *polypathic*.

The species of the first division must be necessarily limited, and determined by the morbid conditions which the organs are liable to assume. Hence they will be the four following:—

1. Atonic gastro-enteric dyspepsia.
2. Inflammatory gastro-enteric dyspepsia.
3. Irritable gastro-enteric dyspepsia.
4. Follicular gastro-enteric dyspepsia.

Even in these species it will seldom be found that the morbid condition exists in an equal degree in every organ of the apparatus; but, on the contrary, that it usually preponderates more in one than the other, thus approaching to some of the elementary species.

The second division admits of a much greater variety of species, co-extensive with the combinations into which the four morbid conditions are capable of entering. The following are those most frequently observed:—

5. *Atonic Gastric with Inflammatory Duodenal Dyspepsia.*—It is the constant tendency of long-continued dyspepsia of any form, whether it be atonic, irritable, or inflammatory, to localise itself, to attach itself to one part of the alimentary canal, which in consequence becomes the seat of morbid sensibility, morbid irritability, or of some modification of vitality, or of inflammation, or some other modification of its vascularity. Dr. Wilson Philip has observed that in atonic gastric dyspepsia this occurs most frequently at the pylorus or upper part of the duodenum. Hence one of the most

common forms of complicated dyspepsia is the species above indicated. It is deserving of remark that this localisation of the disease, this disposition to confine itself to one point, sometimes removes, frequently relieves, the original disease.

6. *Irritable Gastric with Inflammatory Duodenal Dyspepsia.*—This, also, is the consequence of the tendency just indicated, after irritable gastric dyspepsia has existed for a considerable time, or when it has been treated by heating or irritating remedies. It is met with commonly in persons of anxious, energetic, enthusiastic dispositions, in persons worn out and exhausted with cares, as for instance, in over-anxious mothers. The tongue is generally clean, small, and tremulous; its anterior edge of a smooth, glossy, light red colour; more rarely it is of deep red colour; or it presents a loose velvety appearance, like red plush; the lips are red, and there is a frothy saliva in the mouth. The patient complains of an uneasy gnawing sensation, a sense of fainting or sinking at the pit of the stomach; sometimes there is a constant excruciating pain in that situation. The uneasy feelings are much increased by medicines; they invariably irritate, produce discomfort, or disturb the digestion. The pulse is generally quick, wiry, and small, the skin dry and harsh, particularly the palms of the hand, which are rough; the urine is alternately pale and sedimentous.

7. *Inflammatory Gastric with Atonic Colonic Dyspepsia.*—This is a complication common in young scrofulous subjects, male as well as female.

8. *Irritable Gastric with Atonic Colonic Dyspepsia.*—Vomiting, more especially after meals, is the most leading symptom of this complication. It appears to arise from pressure of the loaded colon upon the stomach.

Of the complications of the different morbid conditions in the same organ of the apparatus of digestion, we must also reserve the consideration for another opportunity.

The only apology we have to offer for having occupied so large a share of the time and attention of the reader, is the importance properly attached to the disease which is the subject of the present article; for if considered in its almost universal prevalence and in its remote consequences, it is the source of more suffering to man than any other to which by his physical nature he is exposed, and, therefore, ought to precede all others in its claims upon the attention of the physician. It is, indeed, a very egregious mistake to imagine that this opinion, which attributes health to a pure digestion, and every species of disease to its disorders, is one of recent growth. It is one which has been sanctioned by the experience of the greatest physicians of every age and country. To the greatest of them all, the healthy state of the function of digestion seemed so important, that he has not hesitated to declare, if not exactly in so many words, certainly in equivalent terms, that he who shall have discovered the means of a healthy digestion (which he considered to consist in the exact adjustment of food and labour,) shall have discovered the great secret of health: ἢν μὲν γὰρ ἦν εὑρετὸν ἐπὶ τούτοις, πρὸς ἑκάστην φύσιν, σίτου μέτρον, καὶ πόνων ἀριθμὸς, μὴ ἔχον ὑπερβολὴν, μήτε ἐπὶ τὸ πλέον, μήτε ἐπὶ τὸ ἔλασσον, εὕροιτο ἂν ὑγιείη τοῖσιν ἀνθρώποισιν ἀκριβῶς. (De diætâ, lib. i. sect. 8.) In this respect Aretæus has gone a step beyond the father of physic; for to a healthy digestion he not only attributes health of body, but also health of mind: στόμαχος ἡδονῆς καὶ ἀηδίης ἡγεμών· καρδίης καίριον γειτόνευμα, ἐς τόνον καὶ θυμὸν ἢ ἀθυμίμν, τῆς ψυχῆς συμπαθείη· ἥδε στομάχου πρώτιστα δύναμις. (De causis et signis diuturn. morb. lib. ii.) And to give this opinion only its full extent, we may add with all propriety, that sweetness of temper, clearness of intellect, vigour of understanding, correctness of judgment, firmness of character, power of self-control, are preserved by a healthy state of the digestive organs, and may be lost by their disorder; for as it is by the diseases of these organs that intemperance works its mischief, all that sages, all that philosophers have delivered in praise of the virtue of temperance, may, without stretching a point, be fairly predicated of the healthy state of the function of digestion. When will legislators stoop to consider, or when shall legislators be made to comprehend, the influence of physical causes upon moral conduct?

The state of the digestive organs has the greatest influence upon the state of the other organs of the body. Their disorders are frequently the cause, frequently the consequence, of the disorders of other organs. "Sur dix cas de maladies aigues," says one of the most distinguished pathologists of the present day, "qui ont leur point de départ ailleurs que dans le tube digestif, il en est huit à-peu-près dans lesquelles on observe un dérangement plus ou moins prononcé, soit dans la texture, soit dans les fonctions du canal intestinal. Dans les maladies chroniques, quelle qu'en soit la nature, il est infiniment rare que le tube digestif ne subisse pas quelque alteration." (*Andral*, Anatom, Patholog.) A similar opinion had been expressed by Cullen: "I am of opinion that we cannot bestow too much pains on the consideration of the affections of the stomach, as we find that, next to the pyrexiæ, they are the most frequent occurrences in practice." From these statements we might learn, did we not all already know, that there is scarcely a disease which afflicts the human body that can be correctly treated if the nature of the diseases of the digestive organs be not properly understood; and we may infer how much the difficulty of their treatment is increased, when, as Aretæus observes, the means which restore the health and recruit the strength in other diseases, are noxious in these; ἡ ἐν τοῖσι ἄλλοισι πάθεσι μετὰ τὴν θεραπείην δίαιτα ἐς ἰσχὺν καὶ κράτος τοῦ σώματος εὐπεψίη ἀγαθή· στομαχικοῖσι δὲ μούνοις ἥδε γίγνεται πλημμελής. (De curatione diuturn, morb. lib. ii.) A thorough knowledge of dyspepsia in all its forms and varieties may therefore justly be considered the key to the cure of many acute and of most chronic diseases.

The mischief which springs from the disorders of the function of digestion is not limited to the individual—it extends to the offspring; for the disposition to these diseases being hereditary, and increasing in virulence as it descends, the dyspepsia of one generation becomes scrofula, consumption, or some other malignant disease in the succeeding ones; hence the decay and extinction of families, and all the manifold attendant miseries. When will parents, besides, if not before, wealth and honours, think of bequeathing health to their children?

Moreover, as the diseases of the function of digestion may be said to belong peculiarly, if not exclusively, to a state of civilization, following it as closely as the body is followed by its shadow, they may be considered as the physical process by which luxury and refinement work the deterioration of the species, and prepare its decay—the under-current, which, setting against, stays or frustrates the progress of society. When will the physical state of the body cease to be deemed an unworthy means of promoting our moral—our religious improvement?

T. J. Todd.

INDURATION,

(*induratio*, from *indurare*, to become hard.) This term is employed to designate an increase in the natural consistence of organs, in contradistinction to that of *softening*, which is used to denote the opposite state, or a diminution of the same property.

GENERAL PATHOLOGY OF INDURATION.

1. *Physiological Modifications of Consistence.*—In order to form an accurate estimate of the modifications which take place in the consistence of tissues or organs in a state of disease, it is essentially necessary to possess an accurate knowledge of the degree of consistence which these tissues or organs respectively possess in the normal state, as well as of the remarkable modifications which this property manifests not only in the different periods of life, but also during the progressive development of animal organization. The changes of consistence which are observed to take place under these different circumstances, although sometimes great in degree and extent, are nevertheless to be regarded as physiological conditions, and which mark in a particular manner the intermediate stages and extremes of life. Thus, when the phenomena of organization are about to manifest themselves in the impregnated ovum, nothing is discovered but a colourless liquid; organs when first perceived in the embryo are a mere jelly; and during their development, and in proportion as they approach to the perfect state, do they acquire a gradual increase of consistence. This progressive increase of consistence keeps pace with their development, and does not acquire that degree which belongs to each tissue or organ in particular, until it has arrived at a perfect state of formation. Now, we cannot but perceive here that the degrees of consistence must serve some important end; that even the almost fluid state of parts is not to be looked upon as a mere consequence either of an entire want or of an imperfect state of organization, but that it is a condition of organs or of the materials of which they are composed, subservient—if we may so speak—to the elementary acts of life; a condition which facilitates the transitions of form which organs must present before they can attain their more permanent and perfect state. By means of this condition of organs, whether transitory or permanent, nutritive elements subservient to growth and development find a nidus fitted for their reception, and fluids every facility for passing in whatever direction they are wanted; organs are moulded to the forms of the parts destined to receive and protect them; and numerous relations of bulk, position, situation, &c., are reciprocally adjusted between the containing and contained parts, as the changes which they undergo may render it necessary, in order to maintain the integrity and secure the well-being of each.

At the different periods of life, infancy, manhood, and old age, the consistence of the various tissues of the body, and consequently of organs, present great variety. In the first they are soft, spongy, largely embued with fluids, easily torn or broken; in the second, firm, more compact; the fluids are less abundant, and the solids resist considerable efforts to tear or break them. In the last period, the proportion of fluids is still less, and the solids have arrived at their maximum of density and cohesion.

The consistence of organs varies likewise according to sex, constitution, and the various conditions of life in which the individual has been placed. The difference of consistence arising out of these states is, however, by no means equally marked in all, and least as regards sex, if we except the cutaneous and muscular systems, which, in the female, are more delicate and softer than in the male. Those states of the body which are connected with the predominance of the lymphatic system are characterized by a soft, flabby feel, the opposite of that which accompanies what is called a sanguineous temperament; and as an instance of the modifications of consistence which organs undergo in individuals submitted to the influence of external causes, we may refer to such as are the result of climate and various modes and conditions of life. The modifications of consistence, however, which depend on sex, constitution, or conditions of life, are, perhaps, never so great as to be confounded with those which constitute morbid states of this property of organs. It is far otherwise in the different periods of life; a degree of softness or induration equal to that which characterizes even the extremes of certain pathological states, constituting the peculiar character of certain parts at the periods to which we allude. Thus, the brain of the new-born infant, the mucous membrane, and even the muscles of organic life, are so soft as to be ruptured or broken down into a pulp by a slight degree of pressure or traction, just as we find to be the case in softening of these parts from disease, in after life. On the other hand, in advanced life, the cellular tissue; membranes, particularly serous and fibrous; the muscles and tendons; bone; the brain and nervous system; and particularly the uterus and ovaries, sometimes acquire a degree of hardness equal to that which is known to be produced by certain diseases, and which, by some pathologists, has even been described as a state of scirrhus of these organs.

It may not be unimportant to observe here, that numerous modifications of consistence similar to those which take place in man at the different periods of life, are found to exist in certain parts of some kinds of animals. In them, however, it is a primary condition, necessary for the accomplishment of important functions, and, generally speaking, in no way dependent on changes induced by subsequent development, as in man. The conditions to which we allude consist in an increase of consistence, or a positive conversion of one tissue into another of a similar but denser kind; a change necessary to enable the animal to live in a manner suited to its wants and the place which it holds in nature. Thus, in some animals, the cellular tissue, instead of being soft, spongy, and highly extensible, is naturally firm, dense, and fibrous; the epithelium, an opaque, thick covering; the sclerotic, a cartilaginous or osseous case; the epidermis, a horny envelope, &c., &c. The analogous changes which take place in man constitute pathological states, and not only subvert but entirely destroy the properties and functions of the organ in which they are accidentally produced.

If the physiological changes in the consistence of organs which we have noticed are properly understood and applied, they will serve to explain many of the pathological changes which occur in man, whether we consider these in relation to the causes by which they are produced, the phenomena which accompany them, or the effects to which they give rise. These varieties in the physiological consistence of similar tissues in different animals show likewise, that when they occur as pathological states, they are in all probability subjected to the influence of the same general laws as the former; that the limits which separate the two states, that is, of health and disease, can be defined only by a reference to a change of structure or function as regards the particular tissue, system, or organ, in which it occurs, the age, sex, or kind of animal in which it is observed. Hence, in our examination of this, as well as of every other modification which takes place in the internal and external conformation and composition of organs, the necessity of taking as the point of comparison that state of each which is found to prevail at any particular period of life, and which constitutes the type of the condition whose changes we wish to describe.

II. *Pathological modifications of consistence.*—We have already observed that the opposite changes of consistence of organs are named softening and induration. The latter only will be examined in the present article. A greater or less increase in the consistence of organs, particularly of the softer ones, has always attracted the attention of the pathologist, and whether existing alone or in connection with other changes, has sometimes enabled him to determine the particular nature of a disease, more frequently to detect diseases at their commencement, even when no alteration of the bulk, form, colour, sensibility, or temperature of the part, was perceptible. Hence the importance which has long been attached to this physical alteration, but which, as regards its diagnostic value, may be fairly considered as having seldom served any higher purpose than a signal of alarm of present or of future danger. It is only within these few years that induration and inferior degrees of this state have been more successfully studied, and the knowledge thus obtained more usefully applied as a means of diagnosis. Several diseases, indeed, which were believed to consist simply in an augmentation of cohesion, in an increase of density of the solid materials of a tissue, are now known to depend on very different states; that a morbid increase of consistence is much more frequently dependent on the presence of an accidental or new product, fluid or solid, external to or combined with the tissue which is so altered, and consequently, that it is in these cases merely an effect, and no index whatever of the nature of the disease on which it depends. Mechanical, microscopical, and chemical analyses have shown that this physical condition varies much in its nature in the same or different tissues; and observation and experiment have also shown that it is produced by causes of a very opposite kind, and that the modifications of function by which it is accompanied are no less diversified. Since, therefore, induration is, in general, to be regarded as a symptom of previous or co-existing diseased states, it would appear to us to be of great and essential importance to determine, before proceeding farther, what the diseased states are on which induration depends.

Every degree and form of induration may be referred to changes which take place in the conformation and composition of organs.*

1. *Induration depending on changes which take place in the conformation of organs.*—The only change comprehended under this head, which gives rise to induration, is that of bulk.

Under change of bulk we include hypertrophy and atrophy, and changes in the quantity of the fluids of nutrition and secretion, as conditions which are not unfrequently accompanied with an increase of consistence of the otherwise natural and healthy texture of organs. Hypertrophy, however, is the only state in which increase of consistence can be regarded as a simple disease, inasmuch as it does not depend on the presence of a foreign product; the increased consistence in such a case being a consequence of a superabundant, molecular deposit of nutritive matter of a homogeneous kind in a tissue, and arranged in the normal order. But, that an increase of consistence depending on these circumstances should follow, it is not necessary that it should be accompanied by any change of bulk of the organ in which it is observed; for there may be hypertrophy without change of bulk, from the mode in which the additional deposit takes place.

The most remarkable examples of morbid increase of consistence, depending on an augmentation in the quantity of healthy solid material which enters into the composition of organs, are met with in those which are naturally soft; as in the medullary and cortical substance of the brain and spinal marrow; in the lymphatic and salivary glands, and in the cellular and muscular tissues, and even in those tissues which are naturally firm and hard, as the fibrous and osseous, in which the induration is sometimes extreme. The brain has not unfrequently been found increased to twice and even thrice its natural consistence; that of glandular, cellular, fibrous, and muscular tissues, become so hard, that they occasion a particular grating sound when cut; and the walls of some hollow organs, naturally soft and flaccid, acquire such a degree of firmness, that they preserve, when empty, a globular or cylindrical form, and spring up with considerable force after sudden pressure· and parts of bones acquire that degree of hardness which has been called eburneoid or ivory-like induration.

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* We employ this arrangement here, having adopted it as the basis of our classification of all organic diseases

Induration, as a consequence of a diminution in the quantity of the healthy solid material of an organ, is, perhaps, never observed, unless it is accompanied by other morbid states. It is only observed in soft, spongy, hollow organs, from which the fluids of nutrition have been removed, and for this reason we shall give examples of it under the following head.

Changes in the quantity of the fluids of nutrition frequently give rise to induration analogous to that which we have just now generally noticed, the one depending on an augmentation of the healthy solid, the other of the healthy fluid materials of an organ. The accumulation of blood in the vessels of the lungs, in the spleen, and tumours of a similar structure in various forms of congestion, produces sometimes a great degree of tension, hardness, and density of these organs.

Great diminution in the quantity of the same fluid is also followed by an increase of consistence of organs. Like the former, it is chiefly observed in the lungs and spleen, which feel as hard as liver, or even cartilage. It is, however, to be observed that the increase of consistence in this case does not follow as an immediate consequence of the removal of the fluids of nutrition of these organs, but depends on the subsequent collapse and approximation of the walls in their vascular and cellular textures. In order, therefore, that induration of this kind should be great or permanent, it is necessary that there should be, besides the primitive cause, (viz., the removal of the fluids,) an external or compressing force. Hence it is that induration of the lungs, of this kind, is met with most frequently in pleurisy; the lung may simply be compressed by the effused fluid, as in the acute form of this disease, or it may in addition be permanently enclosed in a dense fibrous membrane of new formation, as in chronic pleurisy. When a lung in this state is examined, it is found to be indurated merely from the approximation of its solid textures, and may be made to assume by inflation its natural bulk and consistence when the accidental fibrous envelope has been removed from its external surface. The constricting force of such pseudo-membranes is, perhaps, nowhere so marked and so peculiar in its effects as when it covers a portion only of a lung or of a single lobe. When a whole lung is contracted, reduced to the bulk of the fist, pushed into the hollow summit of the chest, or flattened and fixed along the spine by a dense fibrous covering, the effused fluid is generally believed to be the sole cause of the diminution of bulk of the organ and of its subsequent condensation. Such, however, is not the fact. It is also owing to that very remarkable property possessed by accidental fibrous membranes, by means of which they contract during the last period of their organization, and thereby gradually compress, diminish in bulk or capacity, or entirely obliterate hollow organs. It is, as we have already observed, when pleurisy has been circumscribed, limited to a single lobe or a portion only of one, that the effects of the contractile property of the fibrous membrane are most strikingly illustrated. The portion of lung included in this membrane feels quite solid, hangs pendulous, or projects outwards in the form of a small tongue or dog's ear; or it may have a conical or cylindrical form of various dimensions. The portion of lung so compressed and indurated is immediately recognised not only from its diminution of bulk and peculiarity of form, but by the pale, uniform, white colour of its accidental fibrous covering, instead of the mottled aspect of the lung under the transparent pleura; and the cause of its density is farther demonstrated from the absence of every external compressing cause, fluid or solid (for it is not necessary that effusion should be present in such cases), except the fibrous membrane, and from its bulk and consistence being restored in the manner already noticed.

Condensation and induration of the spleen are often effected in the same way, that is, from the constricting force of an accidental fibrous membrane.

The last form of induration which we shall mention here, produced by the fluid contents of organs, is that which is found to accompany an augmentation in quantity of the healthy fluids of secretion: as of the milk in the breasts, semen in the testes, bile and urine in their respective reservoirs. The inordinate accumulation of any of these secretions in their proper vessels gives rise to a degree of hardness sometimes equal to that of hard tumours,—a circumstance arising from the incompressibility of the fluids themselves, and the state of condensation of the walls of the organs in which they are accumulated.

2. *Induration depending on changes which take place in the composition of organs.*—The increase of consistence included under this head may be referred to the presence of accidental or new products. These may be either fluid or solid. Of the first kind we have the natural fluids of nutrition and secretion, and some anomalous fluid products; of the second, we have all the solid accidental and new products which are found in the different textures and organs of the body. By far the greater number of these products require only to be named in this place, inasmuch as the induration which they produce depends on the degree of consistence which they themselves possess, and not on any change induced in the texture of the organ in which they are formed. There are, however, others, some of the natural fluids, and various anomalous fluid products, which, when effused into natural or accidental cavities, occasion from their accumulation, or the rapidity with which they are effused, great increase of consistence of the containing solids. When blood, or serosity containing various proportions of albumen and fibrine, is effused into the cellular tissue or the cavities of organs, the distension which these fluids occasion is sometimes so great as to render parts naturally soft and flaccid, quite dense, and almost unyielding. Thus the parenchyma of organs and the cellular tissue in general, when they become the seat of hemorrhage, as pulmonary apoplexy, ecchymosis, &c., feel sometimes quite hard; and such is the state of the walls of the abdomen from the great accumulation of serosity in ascites, and of the cellular tissue of the extremities in œdema. The effusion of serosity into the intermuscular cellular tissue produces sometimes an extreme degree of induration, even when

the muscular organ is not submitted to the influence of any external compressing cause. This is particularly observed in œdema of the tongue, in which this organ becomes as hard as a piece of wood. The same state is met with in the heart, although in a much less degree; also in the brain, liver, salivary and lymphatic glands. What is called hepatization of the lungs is a modification of consistence of a similar kind, but is produced by the presence of coagulable lymph, pus, and blood, as well as serosity.

To complete the general view of the diseases from which induration may arise, we have only to add that the accumulation of gases in the cavity of the abdomen and digestive organs sometimes occasions an extreme degree of tension and hardness of the abdominal parietes, and that collections of pus, atheromatous, melicerous, and other adventitious products, constitute swellings which communicate to the surrounding parts various degrees of induration. We may also note in this place, as a cause of induration, the accumulation of the contents of the stomach and intestines so frequently produced in these organs, particularly from stricture. Thus fæcal matter may be accumulated in the cæcum, and communicate to the hand the sensation of a hard tumour in that region; or the whole of the colon may be similarly distended from stricture of the rectum, and be seen as well as felt throughout its whole course of an enormous size and extremely hard; and the stomach may be so distended in stricture or obstruction of the pylorus as to occupy the greater part of the cavity of the abdomen in the form of a globular swelling, offering considerable resistance to pressure.

Although the state of induration which we have been considering has always been confined by pathologists to changes directly or indirectly induced in the solids, whereby their consistence is increased, we do not see any reason why the same alteration, when considered in a general point of view, and as implying merely a modification of consistence, should not embrace changes of a similar kind which take place in the fluids of nutrition and secretion. The various degrees of fluidity which these products are found to possess, appear, in fact, to present us with some of the most simple forms under which the various degrees of consistence of matter can be subjected to our senses, at least in so far as regards the material of organic composition. Various degrees of fluidity of the blood are observed, from a watery thinness to a state of inspissation approaching to coagulation, which last is, perhaps, a manifestation in an extreme degree of one and the same property. It is, indeed, highly probable that the consistence of the blood depends principally on the fibrine which it contains, and may vary in degree with the quantity and quality of this important constituent, —an opinion, the truth of which appears to be proved by the fact that coagulation of the blood is no other than spontaneous solidification of the fibrine. The opposite state, or extreme fluidity produced by frequent hemorrhage or bloodletting, reduces this fluid to the consistence of serosity, chiefly by the removal of the greater part of its fibrine—a further evidence of the influence which fibrine exercises on the consistence of the blood.

The consistence of the blood is always increased in a greater or less degree by whatever reduces the velocity of the circulation below that of the healthy state. The blood that first flows from a vein in phlebotomy is not only darker but thicker than that which escapes some time after, on account of its having been brought to a state of rest by the constricting force of the bandage; and as the buffy coat is generally increased under similar circumstances, it would appear that the fibrine had already assumed a disposition to coagulation; for cessation in the motion of the blood, even when very limited in duration, is always accompanied by a tendency to separation in its constituent parts and to coagulation of the fibrine. Hence it follows that ligature, tumours, and other mechanical obstacles situated in various parts of the body, and certain adynamic states, as local and general debility, which retard or arrest the motion of the blood, occasion, in the manner just stated, inspissation and coagulation of this fluid,—effects which often lead to other diseased states that sometimes terminate in death.

It may not be out of place to remark here, inasmuch as it is not our intention to discuss afterwards the changes which take place in the fluids of nutrition and secretion in the different organs of the body, that the study of this physical property, whether existing as a primary or secondary diseased state, seems to us to be one of considerable interest, and, as well as many other still more important changes of these fluids, deserves to be carefully prosecuted, and promises to those whose knowledge of animal chemistry enables them to do so, results of the highest importance. There was, indeed, a time in the history of humoral pathology when some of the physical qualities, and in particular the consistence of the blood and other fluids of the body, attracted almost exclusively the attention of the physician. But, whilst an acquaintance with the laws of fluids in motion enabled him to explain some of the changes which he observed to take place in the circulation of the blood, it was at the same time the great source of the many errors which were introduced into the humoral pathology at the period to which we allude. Nevertheless, not a few of the morbid states of consistence of the circulating and secreted fluids were known to the humoral pathologist, and suggested to him the use of various remedies for their cure. The doctrines of solidism, as exclusive as those of its now too much neglected predecessor, led away the mind of the physician from the study of the diseased states of the fluids, or induced him to ascribe the origin of those which he occasionally recognised to some previously existing disease of the solids, of which they were supposed to be merely effects, and to be removed by the cure of the primary disease. Such opinions contain much that is untrue as regards the origin of diseased fluids, and even when effects of disease of the solids, it by no means follows as a consequence that the cure of the one will necessarily be followed by the cure of the other. Facts are not wanting to prove the contrary, and to show the necessity of directing the operation of remedies in such a manner as to effect a salutary change in the pathological conditions of the fluids. But as regards the subject of our immediate consideration — the increased consistence of the fluids of nutrition and secretion—we find not unfrequently examples of this change in the blood of certain individuals labouring under plethora from various causes, and also in many cases of great local congestion, as we have already observed.

Inspissation of the bile is a common occurrence, particularly in the gall-bladder; and here, as in the blood-vessels, the transit of the respective fluids must be more or less impeded by such a change. The formation of gall-stones appears in some instances to depend chiefly on this condition of the bile, which, being thus prevented from passing along the ductus communis choledocus, undergoes the chemical changes necessary for the formation of these accidental products.

Alarming and even fatal consequences arise from inspissation of the mucous secretion of the bronchi, larynx, and even posterior fauces, particularly in individuals debilitated by disease. In such cases the mucous secretion may be perfectly healthy, but having its fluid portion absorbed, it becomes thick and viscid, adheres to the mucous membrane, and accumulates to such a degree as to obstruct the passage of the air, and thus sometimes produces fatal asphyxia. We have ourselves seen the life of more than one individual saved by the removal of this viscid secretion from the posterior fauces and larynx, by mechanical means and change of position. The copious use of cold water given with a view to diminish the plastic property of the blood, is said to have prevented the deposition and formation of the false membrane in croup, or to facilitate greatly its subsequent removal. Are the beneficial effects obtained from the use of mercury in this disease to be attributed to a similar mode of operation?

From these general observations on the diseased states on which induration depends, we may now refer this increase of consistence of the fluids and solids of the body to the following heads:—

1. To a superabundant molecular deposit of solid nutritive matter of the same kind as that which enters into the healthy composition of a tissue—hypertrophy.

2. To an increase in the quantity of the fluids of nutrition and secretion—various forms of congestion, retention, &c.

3. To a diminution in the quantity of the fluids of nutrition—diminution of bulk from compression.

4. To the presence of solid, fluid, and gaseous, accidental and new products — scirrhus, cancer, &c., hemorrhage, dropsy, œdema, tympanitis, &c.

5. To changes which take place in the qualities or elementary composition of the fluids of nutrition and secretion—thickness, inspissation, coagulation.

It is hardly necessary to observe that several of these diseased states may exist at the same time, and by their combination give rise to compound forms of induration of one or several tissues of the same organ. The characters of each kind are, in this manner, much obscured, and can only be determined by a careful examination of the part, so as to discover the particular diseased state on which each kind depends.

Independently of this source of obscurity, the characters of induration are frequently rendered still more obscure from the changes of bulk, form, and colour with which it is accompanied. The principal changes of bulk which accompany induration are already known to the reader. It is only necessary to remind him that induration may exist without any change in the dimensions of an organ, and that an increase is infinitely more frequently observed than a diminution of bulk.

The changes of form with which induration may be connected are extremely numerous; but as they are of no great importance in the present inquiry, we shall only observe that induration is not necessarily accompanied by any modification of this state.

Various kinds of colour are, perhaps, still more frequently found to accompany the induration of tissues, and modify the appearance which they present in a much more remarkable manner than changes of form or bulk. In the second, third, and fourth kinds of induration which we have enumerated, the sources of the greater number of the changes of colour which accompany these states are obvious. But there are others which are derived from the colouring matter of the blood deposited in tissues, or afterwards modified by the operation of external agents. Hence the colour of an indurated tissue may be quite healthy, diminished, or increased in intensity, or it may be entirely different in kind; examples of which are met with in hypertrophy, atrophy, congestion, hemorrhage, jaundice, and melanosis.

Changes in the weight, humidity, transparency, and sonorousness of organs, are not only complications, but frequently the immediate effects of induration. Those of weight, humidity, and sonorousness, are all strikingly exemplified in pneumonia terminating in hepatization; and those of transparency are not rare in membranous tissues.

Having pointed out these sources of complication, we should now proceed to describe the distinctive characters of each kind of induration; but having already entered sufficiently into this part of our subject, which we regard as embracing only the generalities of a morbid state, the physical, anatomical, and chemical characters of which belong to or are derived from other diseases, we have to refer the reader to these diseases, which we have named, for further information on this head. There are, however, certain modifications of function produced solely by the state of induration, and which may be regarded as constituting the physiological characters of this state. These are, modifications of sensation and motion. Thus pain, sometimes of the most acute kind, is produced by the hard unyielding nature of certain tumours compressing or constricting the nerves of sensation distributed to, or which pass in the vicinity of, the diseased organ. Similar effects on the nerves of motion give rise to paralysis. Motion of the solids is, besides, mechanically impeded by induration, which prevents the change of situation and bulk which ought to follow muscular contraction or that of elasticity; and the motion of the blood, bile, urine, and other fluids, may be greatly impeded, or even entirely arrested by the hard unyielding nature of accidental products. Having already pointed out the greater number of these facts which are of any degree of importance, we shall conclude the general part of our subject with a few remarks on the symptoms, causes, and treatment of induration, considered as a morbid affection in the living body.

Symptoms.—The symptoms of induration, considered in a general point of view, are not to be separated from those of the diseases on which it depends; and although the modifications of sensation and motion which we have just noticed are the immediate consequences of this physical change, they do not furnish us with any positive sign of its existence, unless it be at the same time felt or otherwise perceived. Induration, therefore, is not to be detected during life, except in cases in which it is perceived by the touch, or the *mediate sense* of auscultation and percussion,—means which, together with the modifications of sensation and motion mentioned, and those of bulk, form, and colour, to which we have also alluded, will enable us, when properly employed and appreciated, to detect in certain organs the kind, situation, degree, and extent of this morbid state.

Causes.—The causes of induration are also, properly speaking, those of the diseased states on which it depends, and, therefore, anything we might say on this head would be foreign to the present inquiry. Much, however, has been said on the causes of induration, when employed as synonymous with the term scirrhus; but as we regard this state as something more than induration, or induration and hypertrophy united, we think it more consistent with the order which we have hitherto followed, to leave the etiology of scirrhus to be investigated in its proper place.

Treatment.—The principal part of the treatment of induration to which we have to direct the attention of the reader in this place, is that suggested by the modifications induced in the functions of sensation and motion as immediate effects of this physical condition.

When pain arises from induration, and the consequences which frequently follow this change, as weight and tension, it is seldom removed or even much mitigated when seated in internal organs, unless the exciting cause be a fluid. In this case the removal of blood is found to be sometimes followed by great diminution or even the entire cessation of the uneasiness, anxiety, or suffering, which its presence had occasioned; as in great congestion, for example, of the brain and lungs. The good effects of venesection in most cases of plethora are also in part to be attributed to the removal of a quantity of the same incompressible fluid, whereby the organs of circulation, respiration, and innervation are allowed more free and extensive action. The pain which always accompanies the vascular tension of an inflamed part, and more particularly that occasioned by the effusion of serum and pus in the cellular tissue, and beneath unyielding fibrous coverings, is still more remarkably relieved by the destruction of the constricting causes and the evacuation of the incompressible fluids. The relief which patients experience on the removal of the fluids collected in the cavity of the pleura and abdomen in acute inflammation of their respective serous coverings, in some forms of ascites and œdema, in retention of the milk, urine, &c. is to be attributed in no small degree to the judicious application of the same principle.

When pain is occasioned by the pressure of a hard tumour, it may be mitigated or removed by the following means—change of position, warm fomentations, anodynes, extirpation, and other mechanical means. Change of position seldom accomplishes much in the way of removing pain, and has only been found to be occasionally suggested by patients themselves who have accidentally discovered that their sufferings were relieved when in certain positions; as in some cases of pendulous tumours contained in cavities.

Warm emollient applications, from the relaxing effect which they produce on the parts to which they are applied, are often of the greatest benefit. Independent of the benefit which for a time may be derived from the general administration of anodynes, more decided and more permanent advantage has of late been obtained from their local application, in the manner recommended by some French physicians, and called by them *la méthode endermique.* (Essai sur la Méth. Enderm. par Ant. Lembert, Paris.—*Trousseau*, Journ. Univer et Hebdom. de Méd. et de Chir. Pratique, tom. iv. p. 82.) This method, so far as we know, has not been employed to remove pain produced by the pressure of hard accidental products or tumours; but from its successful application in several cases of acute and chronic neuralgia in external parts of the body, we feel strongly disposed to believe that the continued and sometimes excruciating pain which accompanies certain sub-cutaneous and even deeper-seated tumours of the nerves would be greatly relieved or entirely removed by the application of the salts of morphia or belladonna (the remedies hitherto employed) to the denuded skin in the tract of the affected nerve The cure of these cases and others of a similar kind belongs, however, to the province of surgery, and consequently we can only name the third mode, viz. extirpation, excision, and other mechanical means employed in that department of medicine.

With regard to the means to be employed with a view to facilitate the motion of solids and fluids, impeded by an abnormal increase of consistence, we have little to add to what we have already suggested on this head. The physician when compared with the surgeon is wonderfully limited in the means which he has to employ in many of these cases. Those remedies alone which exercise a special influence on the great function of nutrition in general, or on those of hematosis, circulation, absorption, and secretion in particular, seem sometimes to afford a well-grounded hope that many of the diseased conditions which give rise to induration are not altogether beyond the salutary influence of medicine.

SPECIAL PATHOLOGY OF INDURATION.

Having entered rather fully into the general pathology of induration, we do not think it necessary to discuss the special pathology of this disease, unless in the two following cases—induration of the cerebral substance, and induration of the cellular tissue.

I. *Induration of the cerebral substance,*—Perhaps no term has been more vaguely employed by physicians to designate a particular diseased state of the brain than that of induration. There are, in fact, few accidental products which, at one period or other of their development, and formed in the substance or on the surface of the brain, have not been described as induration of this organ. Much of this ambiguity has, however, been removed by a more accurate knowledge of the anatomical characters of these diseases; and however obscure or uncertain may be the origin, nature, symptoms, and treatment of many of them, their being thus brought before us under a distinct and tangible form has already been productive of much good. It is, perhaps, owing to this circumstance alone that so much progress has of late years been made in the pathology of the brain.

The substance of the brain is, as we have already said, subject to an increase of consistence independent of the presence of any foreign product deposited within or upon it. It is only under such circumstances that we admit the existence of induration as a disease. Hence, it is only in certain forms of hypertrophy and atrophy that we find a simple increase of the consistence of this organ. It is, however, by no means easy in every case to determine that an increase of consistence depends alone on a modification of one or other of these conditions of nutrition; for colourless effusions, containing a greater or less quantity of albumen and fibrine, may take place in the fibrous texture of the brain, and produce various degrees of consolidation of the cerebral substance. But when such effusions are not to be detected; when there is no other morbid product present; when the brain or a portion of it is harder than we know it should be at the period at which it is submitted to our examination, we are then to consider it to be in a state of simple induration, whether its colour be altered or not. The degree and extent of such a condition of the cerebral substance may present very considerable variation. Sometimes the increase of consistence is so slight that we only admit its existence as probable; at other times it is so great as to be perceived even before it is touched, on account of the soft surrounding substance falling down when divided, and leaving the indurated portion more elevated. If, in the first case, the augmentation of consistence be circumscribed instead of being general, we have then in almost every case the means of determining how far it is a pathological state, by comparing the part supposed to be diseased with the corresponding healthy part,—a mode of examination which ought always to be had recourse to under similar circumstances in every organ of the body whenever it can be employed. We of course suppose that a previous knowledge has been acquired of the several degrees of healthy consistence of the brain in general, and of its parts in particular.

The several degrees of morbid increase of consistence of the cerebral substance may be represented to the mind of the reader by the changes of consistence which the brain itself undergoes after it has been submitted to the action of alcohol, acids, or boiling oil, for a given length of time. It then cuts like the white of a hard-boiled egg, the udder of the cow when boiled, or firm smooth cheese, such as that of Gruyère. It has been represented to be sometimes as hard as fibrous or cartilaginous tissues; but such degrees of induration of the brain do not, we believe, exist as simple states, and depend on the presence of accidental tissues.

The greater the degree of induration, the greater the change of colour the affected part undergoes: this consists in a diminution or entire want of the natural colour of that part. Hence, the natural colour of the medullary substance being pale, a diminution of colour is principally observed in induration of the brown or cortical substance, which may become so pale as not to be distinguished from the medullary with which it is in contact.

The first as well as the succeeding degrees of induration may present this state of pallor, but it may likewise be redder than natural.—In the former the substance of the brain, when cut, is sometimes moistened with serosity, at other times drier than natural; in the latter it presents a greater number than usual of red points or streaks of blood. A thin slice of the indurated portion may be held out between the thumb and fore-finger, and, when pressed, sometimes snaps through like a bit of boiled albumen. It is only when this diseased state is circumscribed that it has been observed to be great in degree; and when it occupies the whole brain, it generally amounts to little more than what may be called a state of firmness.

An increase of bulk in induration of the cerebral substance is not easily ascertained unless the affected part be in the convolutions, in some of the circumscribed and distinct portions of it, or occupies the whole brain. A diminution of bulk accompanying the same state presents the same difficulties. Both, however, have been observed; but the former much more frequently than the latter.

The brain is far more frequently the seat of induration than the cerebellum; the cortical substance perhaps more so than the medullary; the peripheric portion of the latter more so than the central; the basis than the surface of the hemispheres.

The medulla spinalis, in which this change has also been observed in a circumscribed or general form, is much less frequently affected than the brain, and has seldom been seen to acquire the same degree of morbid consistence, except at its upper portion, and more particularly the medulla oblongata.

Symptoms of Induration of the Brain.—Of the various authors who have observed and described induration of the brain and spinal marrow, some of them have regarded it, when general, as giving rise to ataxic or typhoid fever, and some forms of mental derangement, being in the former an acute, in the latter a chronic state of disease. Others have endeavoured to show that tetanus, epilepsy, and other nervous and convulsive disorders, may also sometimes originate in the circumscribed form of the same pathological state. Whilst we add our testimony to the truth of the anatomical part of the facts on which these opinions have been founded, we must at the same time say that we feel but little disposed to place much reliance on the diagnostic value of the symptomatic details which these authors have collected on this subject. In the present state of our knowledge we believe that we possess no means of detecting the existence of induration of the brain and spinal marrow during life, the symptoms which have been found to accompany it—such as various modifications of sensation, motion, and intelligence—being common to many very different morbid states of the same parts. The derangements of function which follow as the immediate consequences of induration of the cerebral substance are, indeed, sufficiently obvious to the physician; but, for the reasons just stated, they afford him little or no assistance in determining the nature of the lesion on which they depend.

Causes.—The etiology of this morbid state is by no means so well understood as some pathologists would have us believe. That certain forms of it depend on a previous state of irritation, every one must admit; but that this state of irritation, or any modification of it, is the sole cause of induration, is by no means in accordance with the results of observation. In that firmness of the brain in general, observed in some forms of fever accompanied with more than ordinary excitement, and in some cases of acute hydrocephalus, in some kinds of mania accompanied or not with paralysis, irritation of the brain or its membranes may be regarded as at least the probable cause. Circumstantial induration of the cerebral substance may also originate in the same cause, inasmuch as we find it present and in juxta-position with other diseased states, such as ulceration and abscess, having a similar origin. But for reasons equally cogent, we are led to reject the evidence on which it has been attempted to establish the general application of this principle to the etiology of this disease. When, as we have stated in the introductory part of this article, we find that portions of organs, and even whole organs, acquire a great increase of consistence without presenting any, even the slightest, modification of function as is observed to accompany irritation; that the same organ (the brain too) is soft at one period of life and firm at another; that an organ that is soft in one animal is hard in another; we cannot resist the conclusion that increase of consistence—that is, induration—when occurring out of the usual order of place and time, may nevertheless be something else than a consequence of any morbid state with which we are yet acquainted, however much we may pretend to be familiar with its ways of working. It would seem to us to be much more consistent with a sound philosophy to attribute the production at least of some of the forms of induration of organs to the influence of other and still more general laws than those of irritation, viz. those of organization; and, moreover, that instead of occupying the rank of a cause, irritation in this as well as in numerous other instances follows as an effect, and thence becomes a valuable evidence of the existence of the former.

Treatment.—As the causes of induration are obscure, and more particularly as we are unable to recognise the existence of this state during life, we have of course no indications or modes of cure to propose. We except, however, from this barren and unsatisfactory result that form of induration which we have stated may arise from an augmentation in the quantity of blood usually admitted into an organ. Such is the state of the brain in congestion, the treatment of which is given in another place. It may not be unimportant to remark that the principal phenomena of congestion, loss of sensation and motion, seem to be the immediate effect of the state of induration induced in the cerebral substance by the accumulated blood: the degrees of density alone, which is thereby induced, being sufficient to unfit the organ for the accomplishment of its functions, independent of the other changes which we well know follow as a consequence of such congestion.

II. *Induration of the Cellular Tissue.*—*Syn.* Induratio telæ cellulosæ, sclerema; squirrhosarque; œdème concrète; œdème du tissue cellulaire des nouveaux nés; zellegewebsverhärtung; skin-bound disease.

The cellular tissue affords so many facilities for the formation and development of disease, that it has been regarded by several pathologists as the primary seat of almost all morbid products. Various circumstances, the exposition of which does not come within the scope of this article, concur to give rise to such a belief, but which is as little founded in fact as every other exclusive theory regarding the common origin of diseases. The pathological state which we have to examine furnishes a striking example of the fallacy of such generalizing principles, induration of the cellular tissue being, in point of fact, one of its most equivocal characters.

Induration of the cellular tissue constitutes a case of complicated induration, depending exclusively, as regards the local affection, on an accumulation of serosity or sero-albuminous fluid in the cellular tissue. It is therefore only in accordance with custom that we have introduced this state under the appellation of induration of the cellular tissue. We shall, however, employ the term *œdema* (instead of induration) *of the cellular tissue*, as it fully and accurately expresses the condition on which the induration depends, to which we may add *of new-born children*, to distinguish it from that which occurs at an after period of life. Although this affection is generally observed in children a very few hours after birth, it may occur several days later; and there are examples of children having been affected with it when born.

The subjects of this disease are for the most part feeble; sometimes imperfectly developed, and generally born before the full period. They do not seek the breast, but refuse to suck; they are agitated almost continually, and have a peculiar cry. The skin is dry, cold, as if stretched; generally of the natural red colour, but sometimes purple or livid. The soft parts feel firm, or even hard; when pressed they become pitted, and of a dull yellow colour; but the primitive form and colour soon return, unless the œdema be extreme. These appearances are generally observed to begin in the inferior extremities, passing from the feet upwards, and sometimes proceed with great rapidity, attacking the hands and arms; the inferior part of the abdomen, back, and face. Sometimes it appears to affect almost all these parts simultaneously, and nearly to the same degree. More rarely it is confined to the feet and hands. The bulk of the affected parts is increased, particularly that of the inferior extremities, but by no means in proportion to the degree of induration which they communicate to the hand when pressed. The diminution of temperature of the affected parts follows in a descending ratio the progress of the œdema, and in some cases has been observed to precede it. The production of heat is rapidly diminished over the whole body; the inferior extremities become quite hard and stiff; the superior extremities and trunk less frequently to the same degree. In extreme cases the application of heat to the body only acts upon it as on dead matter, its temperature being suddenly raised or cooled as the warming medium is applied to or removed from it.

The other signs of functional derangement which accompany this affection increase in severity with the same rapidity. The respiration, at first imperfect, becomes difficult and laborious, and the pulse so feeble as sometimes not to be felt. In this state death supervenes from asphyxia, generally within the fourth day, sometimes on the first, and more rarely at the end of one, two, or even three weeks.

These are the most prominent and remarkable symptoms; those which may be regarded as proper to the disease. The symptoms of jaundice, although frequently present, are, however, perfectly distinct from those of this form of œdema. The same may be said of those of cerebral, gastric, intestinal, and acute pulmonary affections, which have been regarded by some as giving rise to the affection.

The characters of this disease are so well marked that it cannot be confounded, unless when circumscribed, with any other disease by the most careless observer; and even in this form it is only necessary to note the diminution of temperature which accompanies œdematous swelling, to distinguish it from any inflammatory affection of the skin which gives rise to a similar state of the cellular tissue, and in which the temperature of the affected part is always morbidly increased.

It is rare that the physician has the satisfaction of being able to pronounce a favourable prognosis in this affection after it has arrived at a certain stage. It is only when the œdema is limited in extent and not great in degree; when the circulation and respiration are not much affected; when the temperature has not sunk much below the natural standard, and when the strength of the infant can be supported by its taking the breast, that a favourable termination may be reasonably expected. In such cases, as well as in those of a severer kind which recover, the signs of a favourable issue are to be drawn from the amelioration which takes place in the state of the respiratory function, which becomes less embarrassed; the increasing strength of the pulse; the gradual elevation of the temperature of the skin; the diminution of the swelling, and particularly of the induration; the disappearance of the deep red or livid colour which it may have presented, and the supervention of a gentle moisture over its hitherto dry surface—the child becomes quiet, sleeps, and manifests a desire for food.

Before proceeding to examine into the causes of œdema of the cellular tissue of new-born children, we shall, in the first place, endeavour to give a correct statement of the facts which the morbid anatomy of this disease has enabled us to collect.

The external aspect of the body is but little changed after death. The affected parts still preserve the same colour; the face and upper part of the trunk are even more swollen, and the induration in general is rather increased than otherwise; the softer parts, such as the face, evidently so.

When a section of an œdematous extremity, the leg for example, is made so as to expose fully the subjacent cellular tissue, instead of finding this tissue compact and indurated, we find on the contrary its cellular aspect much increased, from the cells being filled with a serous or sero-albuminous fluid, which is either quite limpid, of a citrine colour, or tinged with blood. The quantity of this fluid is in proportion to the degree of swelling and induration which accompanies it. If small in quantity, the cellular tissue requires to be pressed before its presence can be recognised; but when abundant, it distends the cells of the subcutaneous cellular tissue, and a part of it oozes or flows out from the compression which the divided skin exercises upon it, or by its own specific gravity. When the whole of this fluid is forced out by pressure from the subcutaneous cellular tissue, it then feels soft and extensible; and the skin, which was before stretched and fixed, becomes lax, and can be moved over it as in the healthy state. When examined narrowly, it is found to present no thickening, opacity, or change of consistence. Its colour may be natural, or reddened by a slight degree of vascularity. The intermuscular cellular tissue may present the same appearances, but in a much less degree.

When the serous effusion occupies the adipose as well as the cellular tissue, the feeling of hardness is increased. The granules of fat, so conspicuous and firm in the child, are in this way compressed between two forces. They appear whiter than usual, resemble the fat of meat, and are hard, as if frozen. This state of the adipose tissue does not necessarily accompany œdema of the cellular tissue, as it occurs frequently without it.

From these facts, the truth of which we have had ample opportunities of verifying in a large hospital set apart for the reception of new-born children—the *Enfans Trouvés* at Paris, it must appear obvious that the state of induration observed in these children is a purely mechanical effect, depending on the accumulation of a fluid in the subcutaneous cellular tissue. The term induration never could have been employed to designate such a morbid state, had those who first observed and described it submitted the affected parts to careful anatomical investigation. Denman, Underwood, and others since their time, have stated that the cellular tissue, in the cases which they observed, was not only hard but *dry*. As we have never met with one example of such a nature among the great many cases which we have examined, and as we know that the disease which they described is the same as that of which we are now treating, we feel disposed to doubt the reality of such cases. It would serve no good purpose to multiply facts to prove that these pathologists have been also deceived who havdescribed the cellular tissue in this disease as thickened and hardened; particularly Allard, who considered it in this respect as analogous to the elephantiasis Arabum, or what is commonly called Barbadoes leg. (See **Elephantiasis.**)

The presence of a greater or less quantity of serosity or sero-albuminous fluid in the subcutaneous cellular tissue constitutes the essential anatomical character of the disease we are describing; and in this respect it is to be regarded as œdema, differing perhaps little even in its nature from that which is much more commonly observed in adults, as a consequence of disease of the organs of circulation and respiration, and in whom it also presents to the touch the sensation of various degrees of induration.

Not satisfied with this simple explanation of induration of the cellular tissue of new-born children, some pathologists would have the effused fluid possess the property of becoming concrete, and to this circumstance they attribute the degree of hardness which the affected part communicates when pressed. For this reason, also, they regard it as different in its nature from the œdema of adults, and have on that account, and to distinguish it from the latter, called it *concrete œdema.* The results of some experiments made by Chevreul on the effused fluid taken by Breschet from the cellular tissue of children affected with œdema and jaundice at the same time, (a very frequent complication,) appeared to confirm the opinion that the induration depended on the coagulable nature of this fluid. Subsequent experiment, however, has shown that the inference drawn from the fact of the coagulable property of the effused fluid was by no means correct; for not only is this fluid not found in a concrete state in the cellular tissue of new-born children affected with œdema, but the property which it possesses of coagulating spontaneously when placed in a state of rest, and exposed to the influence of the ordinary temperature of the air, exists also in the fluid found in the cellular tissue of adults affected with ordinary œdema. In all cases, in fact, of œdema produced by an obstacle to the return of the venous blood, does the effused fluid possess this property; and so far as our experience enables us to judge, the more sudden the production of the œdema, the greater the spontaneous coagulability of the effused fluid. Hence the reason why in the œdema of new-born children, in whom the effusion generally takes place rapidly, this coagulable property is more marked than in the chronic œdema of adults. Notwithstanding these facts, we must repeat that the state of induration is neither caused nor increased by this circumstance, for we have never found the fluid coagulated in œdema of the cellular tissue after death. That it is not coagulated during life we know, from the fact that it flows out when the skin is punctured.

Besides the state of the cellular tissue which we have described, various morbid appearances are observed in different parts of the bodies of those who die of infantile œdema. Some of these are always present, and are therefore to be regarded as essential to the production of the disease; others are only occasionally met with, and on that account must be viewed in the light of coincidences.

The most remarkable among the constant lesions is a state of general venous congestion. The heart and great blood-vessels are filled or distended with blood; the lungs and liver, and indeed all the soft parts, are in a high state of congestion, particularly the former, which, when cut, discharge a great quantity of dark venous blood. There exists no mechanical obstacle in the heart, great blood-vessels, or lungs, to which this accumulation of blood can be attributed; and on that account it resembles plethora more than any other affection.

We need hardly observe that it is to this state of general congestion that the effusion of serosity in the cellular tissue is to be attributed, and that the same state of congestion, and the œdema which follows it to the lungs, are the causes of the difficulty of breathing which is present in this disease. The languid state of the circulation, and the stagnation of the blood in the capillary system in general, appear to us sufficient to account for the remarkable diminution of temperature which takes place in infantile œdema.

With this state of congestion there is, also, a greater or less degree of œdema of the cellular tissue of the viscera of the thorax and abdomen, and effusion of the same fluid into the serous cavities. The submucous cellular tissue in general is more or less œdematous; and it is this state of that glottis which occasions the cry peculiar to children affected with this kind of œdema.

These are the most remarkable of the constant lesions in infantile œdema. Those which occur accidentally, but which have been regarded by some pathologists as the causes of this kind of œdema, are numerous. The principal of them are acute affections of the lungs and liver, of the stomach and intestines, or of these and the subcutaneous cellular tissue at the same time; the non-occlusion of the foramen ovale; and a diminution in length of the intestinal tube.

Without denying that most of these morbid states, and some of them much more than others, contribute, when present, to increase the effusion into the cellular tissue, we are more disposed to believe that they are much more efficacious in retarding or rendering its cure impossible; and we are persuaded that they have no direct effect in producing it, since we have found it to exist in an extreme degree when there was no other appreciable morbid condition to be detected but the general state of congestion which we have described.

After these remarks we trust it will not be considered an omission, if we overlook most of the theories, or rather hypotheses, which have been entertained regarding the etiology of œdema of the cellular tissue of new-born children.

Andry and Auvity, the first who gave a good description of this disease, attributed its production to the action of cold; but although it occurs more frequently in winter than at any other time of the year, it is often observed in summer and under circumstances the most favourable as to external temperature.

The opinion of Breschet, that the effusion of serosity in the cellular tissue depends on the permanent opening of the foramen ovale, was soon shown to be unfounded. Indeed it is difficult to conceive how this intelligent pathologist could have offered such an opinion as the result of his observation. "In seventy-seven children," says Billard, (Traité des Maladies des Enfans Nouveaux-Nés, &c., Paris, 1828,) "affected with œdema of the cellular tissue, there was in *forty* of them *complete occlusion* of the foramen ovale, and in twenty-eight of these even the ductus arteriosus was considerably contracted, and did not allow the passage of the blood through it. The explanation of Mons. Breschet falls, therefore, before the evidence of facts. If the foramen ovale is still found frequently open in *hard children*, it is because induration of the cellular tissue affecting particularly very young children, the changes which take place in the heart and ductus arteriosus of the new-born child, after the establishment of the independent circulation, have not had time to be completed when the œdema appears. I think, therefore, that there is no relation between the two phenomena in question."

The last opinion which we shall notice is that of Mons. Denis, who has endeavoured to show that an inflammatory condition of the cellular tissue which becomes affected with œdema, and of the mucous membrane of the stomach and intestines at the same time, are the causes of this disease. To characterize this complication, and no doubt anxious to do honour to the *Doctrines Physiologiques*, Mons. Denis has conferred upon it the appellation of *phlegmasie entéro-cellulaire*. Inflammatory affections of the gastro-intestinal mucous membrane are extremely common in infants, and must consequently be met with in those affected with œdema of the cellular tissue; and when we find œdema without them, and vice versâ, we are not permitted to regard their simultaneous existence otherwise than as a coincidence. That the œdema of the cellular tissue is the consequence of inflammation, no pathologist who has examined it, and whose judgment is not biassed by preconceived notions, will believe. Were such the fact, we should find sometimes, if not always, some of the products or effects of inflammation of the cellular tissue, such as coagulable lymph or pus, or softening; which we ourselves (or, we believe, anybody else, not excepting even Mons. Denis,) never once have met with.

Mons. Baron, who for a number of years has been physician to the Enfans Trouvés, regards the œdema of new-born children as analogous in every respect to that of adults.

An accurate observer and distinguished pathologist, Mons. Billard, who has had ample opportunity of studying this disease, considers its predisposing causes to be, 1st, a natural state of debility of the new-born infant; 2d, a state of general congenital plethora; 3d, a superabundance of venous blood in the tissues; 4th, a state of dryness of the skin before the exfoliation of the epidermis: and the direct causes, 1st, an obstacle to the course of the blood, resulting from the abundance of this fluid in the circulating system; 2d, its regurgitation in the cellular tissue, to which it furnishes an inordinate supply of the materials of secretion; and lastly, the action on the skin of external agents, which, without condensing, as has been said, the serous fluids, are capable of suspending the cutaneous transpiration, and thereby favour the accumulation of the serosity in the cellular tissue.

[M. Valleix (*Clinique des Maladies des Enfans Nouveau-nés*, Paris, 1838) from a consideration of the difficulty of breathing, which constantly exists, even in slight cases, along with the feebleness and slowness of the circulation, and the sanguineous congestion which is the result, is led to believe, that the development of the disease is referable to the disturbance in those two important functions, and to the stasis of the blood; hence, he has proposed for it the name of *Asphyxie lente* of the new-born; and MM. Desormeaux and Paul Dubois (*Dict. de Méd.* xxi. 161, Paris, 1840) believe that this term will ultimately prevail, in the place of the one most in use, which merely designates one of its symptoms and results.]

Treatment.—Reasoning on the evidence which we have endeavoured to lay before the reader on the nature and causes of infantile œdema, the curative indications which it suggests are but few in number. The state of general venous congestion that prevails; the diminution of temperature which accompanies this state; the dry atonic condition of the skin, and the state of debility of the little patient, constitute the chief points in the pathology of the disease to which the attention of the physician is to be directed. With a view to diminish the quantity of the blood, and thereby favour its circulation, leeches may be applied to the chest or œdematous parts; a practice which, although we have not seen it fairly tried, is said to have been remarkably successful in the hands of Paletta.

A more safe, and perhaps equally successful method of treatment employed to accomplish the same end, consists in the use of repeated friction with warm flannel, the body in the intervals being well covered with the same material, which is not to be allowed to become cool. The vapour-bath has been recommended; but it has not been found to answer the expectations of some physicians who had ample opportunities of giving it a fair trial. Mons. Baron has found friction and the application of warm flannel to the skin much more beneficial. The difficulty of breathing is sometimes greatly increased while the child is in the bath, and congestion and even sanguineous effusion have been known to take place in the lungs and brain soon after its administration.

If, under the judicious use of the means we have recommended, the pulse improves and becomes steadily more strong, the temperature soon rises, and the physician has the satisfaction to perceive that a gentle moisture breaks out over the surface of the skin. The œdema soon after begins to diminish, and with it the induration which it had occasioned; the motions of the child become more free, and the cry natural; the desire for food returns, and convalescence is complete, sometimes in a few days. Although we are not acquainted with any method of treatment so successful as that which we have recommended, it requires in many cases, either on account of their severity, the debility of the child, or the coexistence of other affections, much discrimination on the part of the physician, and a degree of care and patience not often to be found in those in whose hands it may be said the lives of these little sufferers are placed, to regulate its application, and obtain from it its beneficial effects.

Acute affections of the lungs, stomach, and intestines, are, as we have said, extremely frequent at the same period, and when severe, destroy, perhaps, a greater number of children affected with them than the disease which we have described, and for which no mode of treatment can then be said to offer any reasonable hope of accomplishing a cure.

R. Carswell.

INFANTICIDE.—Before the end of the seventeenth century, medical men were not consulted in cases of infanticide. In the criminal code (Beobachtungen und Abhandlungen von österreichischen Aertzen, 3er. Band. Wien. 1823,) of the Emperor Charles V. it was merely directed that the breasts and parts of generation should be inspected by an experienced and sensible woman, and the delivery being, as it was supposed, ascertained, the proof of the death of the child at birth was imposed on the mother. We are told also by Bohn (Dissert. binæ de partu enecato, p. 336,) that a mother suspected of infanticide which could not be proved, was put to the rack to extort confession of her imputed guilt. In this country the statute of James I. was conceived in a similar spirit, for it concluded the mother to be guilty of the murder of her child, who could not prove, by at least one witness, that the child was actually born dead; a condition under certain circumstances obviously impossible, and thus rendering the statute unjust in its operation by confounding the unfortunate with the guilty. This act continued in force for nearly a century, but at length it became *customary* to require more direct proof of homicide; and by an act passed in the 43d of Geo. III. it was provided that trials for infanticide should be regulated by the same rules of evidence and presumption as were usual in other trials for murder; and thus the subject was brought more distinctly within the pale of medical inquiry.

Infanticide has been divided into *fœticide*, or the destruction of the fœtus whilst yet in the womb, commonly called *criminal abortion;* and *infanticide* strictly so called, or the destruction of the life of the child either newly born or in the course of parturition. The present article will treat of the latter division only; and the evidence respecting it naturally divides itself, 1st, into that which has reference to the child, and 2dly, into that which relates to the mother. The investigation of the following questions will comprise the most material points of medical evidence:

1. Was the child born living or dead?
2. What was the cause of its death?
3. Has the suspected mother been recently delivered?
4. Do the phenomena presented by the supposed mother and child confirm the suspected relationship?

[It may be proper to make a few remarks as to the meaning of the term 'born alive.' This is a question applicable not to infanticide only, but to other cases. According to the English law, where a man marries a woman, seised of an estate of inheritance, and has by her issue born alive, which was capable of inheriting her estate, in such case, he shall, on the death of his wife, hold the lands for his life as *tenant by the courtesy* of England. It has, consequently, been a point of moment for the husband to show, that the child was born alive; and the said authorities have, with singular infelicity, attempted to define what shall be regarded as evidences of this condition. According to Blackstone, (*Commentaries*, B. ii. 127,) "Some have had a notion, that it must be heard to cry, but that is a mistake. Crying, indeed, is the strongest evidence of its being born alive, but it is not the only evidence." According to Coke, (*Institutes*, 30, a.,) "if it be born alive it is sufficient, though it be not heard to cry, *for peradventure it may be born dumb.* It must be proved, that the issue was alive; for *mortuus exitus non est exitus:* so as the crying is but a proof that the child was born alive, and so is motion, stirring, and the like." It need scarcely, by the way, be said, that the deaf and dumb cry at the moment of birth the same as other children. The *natural* cry is effected by them as well as by the infant that possesses all its senses. It is the *acquired* voice alone which they are incapable of attaining. Still, this blunder of Lord Coke does not materially concern the present inquiry; not so, however, the latitudinarian definition, contained in the latter part of the sentence cited from him. In a case that was tried before the Court of Exchequer in England, about forty years ago, the jury agreed that a child was born alive, because, although, when immersed in a warm-bath immediately after death, it did not "cry or move, or show any symptom of life," yet, according to the testimony of two females,—the nurse and the cook,—there twice appeared a twitching and tremulous motion of the lips; and this was sufficient to make it fall under Lord Coke's definition. It is manifest, as elsewhere remarked, (*Human Physiology*, i. 371, Philad. 1844,) that granting such motion to have actually occurred, it was of itself totally insufficient to establish the existence of vitality. On the application of appropriate stimuli, the muscles of a body may be thrown into contraction for hours after the cessation of respiration. Instead, therefore, of referring the irritability or contractility to the existence of life at the time, it must be regarded simply as an evidence, that the parts had previously and recently formed portion of a living system.

According to Mr. Taylor, the English law authorities will admit evidence of life in a child before the establishment of respiration. In the case of R. *v.* Brain, Judge Park properly said, that a child might be born alive, and not breathe for some time after birth. (Archbold, *Crim. Plead.* 367.) The same thing was admitted by Mr. Justice Coltman, in the case of R. *v.* Sellis, tried on the Norfolk Spring Circuit, in 1837. In this instance, it was alleged, that the prisoner had murdered her child by cutting off its head. The judge told the jury, that if the child were alive at the time of the act, it was not necessary, in order to constitute murder, that it should have breathed. Respiration is regarded as one but only one evidence of life.

In England, some decisions have been made as to the legal meaning of the term 'born alive,' in connection with infanticide. According to Dr. Guy, (*Principles of Forensic Medicine*, p

120, Lond. 1843,) it has been decided, in more than one case, that to constitute live birth, the child must be alive after the whole body has been brought into the world. (R. v. Poulton, 5 *Carrington and Payne's Reports*, 329; R. v. Crutchley, 7 *C. and P.* 814; R. v. Sellis, *Ibid.* 850; cited by Guy, *loc. cit.*;) and that it must have an independent circulation. (R. v. Enoch, 5 *C. and P.*, 539; Reg. v. Wright, 9 *C. and P.*, 154.) It would appear, however, that it is not necessary, that the umbilical cord should be separated, for the child may still be connected with the mother by the cord, and yet the killing of it will constitute murder. (R. v. Crutchley, 7 *C. and P.* 814; Reg. v. Reeves, 9 *C. and P.* 25, cited by Guy, p. 121. See also on this subject, M. A. Taylor, *Manual of Med. Jurisp.* p. 472, Lond. 1844.)]

Writers on infanticide, in proceeding to discuss the first question in the inquiry, have generally deemed it necessary to prefix a statement of the development of the fœtus at the different periods of utero-gestation, a knowledge of which is requisite in proving the *viability* of the child, that is, its capability of supporting extra-uterine or independent existence. Some difference of opinion has existed concerning the precise period from which the viability of the child should be dated; but it is generally agreed on among medico-legal writers, that no well-authenticated examples are recorded of children living which had been born before six months of utero-gestation. (Beck's Elem. of Med. Jurisprudence, Dunlop's ed., p. 119.) An exception to this opinion may be thought to have occurred in a case recorded by Dr. Rodman, (Edin. Med. and Surg. Journal, vol. xi. 445,) who describes his patient as having been delivered at the end of the 19th week of pregnancy. The feebleness of the child would appear to justify the correctness of Dr. Rodman's opinion, for when three weeks old, it measured but eleven inches in length, and weighed two pounds and a half avoirdupois, the clothes forming eleven ounces of this weight. But a case has subsequently been published by Mr. Baker, which renders it probable that Dr. Rodman was mistaken, for the child described by Mr. Baker (Transactions of the Med. and Phys. Society of Calcutta, vol. ii.), although born undoubtedly at the full period of utero-gestation, corresponded pretty closely with the one alluded to by Dr. Rodman. The absence of all allusion to the external characters of the child in the latter instance prevents any reliance being placed on it. If the membrana pupillaris had existed, it may be reasonably presumed that it would not have eluded Dr. Rodman's observation, nor escaped remark.

A description of the leading phenomena which the organization of the fœtus presents from the fourth to the ninth month will include everything on the subject which can be interesting in relation to infanticide; and these phenomena relate to its length and weight, the proportional length of its parts, the state of the skin and its appendages; of the pupil of the eye; of the internal viscera, particularly of the abdomen; of the organs of generation; of the brain; and lastly, the progress of ossification. The weight and absolute length of the body furnish but uncertain data, since they vary much in different fœtuses of the same age. But Chaussier (Médecine Légale, &c. par Lecieux, &c. 1819, p. 17,) has pointed out an excellent criterion, founded on a very extensive examination of subjects, in the comparative length of its several parts at different periods. If in a well-proportioned adult a line be drawn from the top of the head to the heel, its centre corresponds with the upper edge of the pubis. But in the fœtus this central point is situated much higher; for in a mature child it corresponds with the umbilicus or a little above it; at the end of the eighth month it is about an inch higher; at the end of the seventh still nearer to the sternum; at the end of the sixth it falls just at the end of that bone.

The average weight of the fœtus at four months is from five to seven ounces; at five months, about a pound; at six months, two pounds; at seven months, from three to four pounds; at eight months, from four to five pounds; at nine months the average weight in this country is about seven pounds (Phil. Trans. vol. lxxvi. p. 394; Hunter's Anatomy of the Gravid Uterus, p. 68), the most frequent range being from five to eight pounds. Lecieux and Bernt have remarked that the length of children at the full period is less liable to variation than the weight. The following is a transcript of the table of the former.

Months.	Inches.
4	5 to 6
5	9½
6	12
7	14
8	16
9	18

And he agrees with Baudelocque in stating the extremes in mature children to be from sixteen to twenty-two or twenty-three inches. (Médecine Légale ou Considérations sur l'Infanticide, p. 11.)

At the *end of the fourth month* the skin is rosy and moderately dense. The pupillary membrane is very visible; the meconium a little coloured, and occupying the commencement of the small intestines. The brain exhibits the interlobular furrow. There is a commencing ossification of the vertebræ of the sacrum. The kidneys are very voluminous, consisting of from fifteen to eighteen lobes, the suprarenal capsules being as large as the kidneys.

At the *end of the fifth month*, the scalp is covered with short silvery thinly scattered hair; the skin is of a deep red colour, but without sebaceous covering; the adipose membrane is but little developed; the nails are scarcely perceptible. There is commencing ossification of the first bone of the sternum, of the pubis and os calcis. The volume of the lungs is small, the heart is large, the ventricles little distinguishable from the auricles; the liver very large and near the navel, consisting of two equal lobes. The gall-bladder contains a little, almost colourless, serous fluid; the spleen is little developed and close to the stomach; the meconium is in small quantity, and only occupies the cæcum and a small portion of the colon. In the male fœtus the testicles are situated beneath the kidneys, near the lumbar vertebræ. In the female the ovaries are small, soft, elongated, very distinguishable from, and in a similar situation to, the testicles in the male. The brain on the surface is smooth, but several deep furrows and convolutions are now visible on the inner aspect of the hemispheres where they are applied to the falx cerebri.

At the *end of the sixth month*, all the external parts are very distinct. The skin is very fine, of a deep red or even purple colour, particularly in the palms of the hands and soles of the feet, face, lips, ears, and breast. The stomach is filled with mucus; a part of the large intestines with meconium. The colon begins to exhibit its sacculated character. The testicles are still in the abdomen under the peritoneum. The bladder, hard, pyriform, and above the pelvis, has but a small cavity. About this period two points of ossification are formed in the second cervical vertebra; near the seventh month the superior point, which answers to the odontoid process, is larger than the inferior, which relates to the body of the bone. According to Tiedemann, the posterior lobes of the cerebrum now cover the corpora quadrigemina, and almost the whole cerebellum. The three cornua of the ventricles are quite distinct. The choroid plexus is very voluminous. The laminæ of the septum lucidum are joined so as to form the fifth ventricle. The corpus callosum extends further backward, but does not yet cover the thalami and third ventricle.

At the *end of the seventh month* the skin is dense and fibrous, and is covered with the *vernix caseosa cutis*, unequally thick in different parts of the body. The pupillary membrane has disappeared. The hair is longer and of deeper hue; the nails are firmer, but do not extend to the ends of the fingers. The bile is yellowish and bitter. The meconium occupies a considerable part of the large intestines. The valvulæ conniventes begin to appear. The testicles and ovaries are nearer the pelvis. The posterior lobes of the cerebrum now cover and extend beyond the cerebellum, and several furrows and convolutions are observable on the surface. The corpus callosum covers the thalami, and consists of transverse fibres passing from one hemisphere to the other. The corpora quadrigemina are divided by a transverse line or furrow rendering them complete and distinct, the two superior, or nates, being somewhat longer than the two inferior, or testes, and their parietes so thick that the iter a tertio ad quartum ventriculum may be considered perfect.

At the *eighth month* the skin becomes covered with very fine short hairs, the skin itself is denser and whiter, and the nails are firmer and more elongated. The sebaceous covering is more general. Oftentimes the breasts are projecting, and a milky fluid may be expressed from them. In the male the testicles are generally engaged in the abdominal ring. About this period the transverse processes have begun to ossify in the first lumbar vertebra. The structure and configuration of the interior parts of the brain, already completely formed, have only to be augmented in volume, the surface to be farther developed. The two hemispheres of the cerebrum extend backward considerably beyond the cerebellum. The hemispheres on each side are traversed with furrows, into which the folds of the pia mater enter, but these furrows, or the convolutions which they produce, are nowhere so marked as on the anterior and middle lobes.

At *nine months* ossification is more complete. The descending ramus of the os pubis and the ascending ramus of the ischium are consolidated. Ossification has commenced in the first cervical vertebra, and also in the first bone of the coccyx. The body of the fourth lumbar vertebra, which is the most voluminous, is three lines in depth and six in breadth. The lateral portions of the six superior dorsal vertebræ begin to unite so as to form a ring posteriorly to the bodies of these bones. The bones of the cranium, although movable, are in contact at their margins. Generally the testicles have passed the abdominal ring, or even descended into the scrotum. The nails are thicker and firmer, and are prolonged to the extremities of the fingers. Capuron states that the grey matter is now visible in the brain, but Tiedemann asserts that at no period is it possible to distinguish between the cortical and medullary substance in the fœtus.

We shall not be understood to pretend that the preceding details will be found precisely to indicate the age of the fœtus. Much variety is found in different children at the same age; but an attention to the criteria now laid down, particularly as they relate to the progress of ossification; to the development of the brain, and relation of the umbilicus to the centre of the body, for which we are indebted to Béclard, Tiedemann, and Chaussier, will enable the inquirer to form a tolerable approximation to the truth.

[In another work, (*Human Physiology*, 5th edit. ii. 470, Philad. 1844,) the writer has drawn attention to the wide discrepancy that exists amongst observers in regard to length, weight, &c., at different periods of fœtal existence. Nor are they more agreed in regard to the test proposed by Chaussier. Of 500 children examined by M. Moreau, at the Maternité, in Paris, the umbilicus corresponded to the centre of the body in four only. In the majority of cases, it was eight or nine lines below the centre; and he found that in some children, born about the sixth or eighth month, the cord was inserted at the middle point of the length. (*La Lancette Française*, 1837.) Among many cases, too, of mature children, which Mr. Alfred L. Taylor had an opportunity of examining, the umbilicus was found to be generally from a quarter to half an inch below the centre of the body. (*Guy's Hospital Reports*, April, 1842; and *Manual of Medical Jurisprudence*, p. 489, Lond. 1844.)]

The advantage arising from the investigation of the anatomy of the fœtus is, that it enables the inquirer to decide on the maturity or immaturity of the child, and to set at rest its capability of being born alive. If the child were mature, the greater is the probability of its having been born living; if immature, the likelihood of death from natural causes is considerable. And in either case it is creditable to the investigator, and indeed necessary in drawing up a medico-legal report on a child found dead, to indicate with some precision the age of the subject under examination.

I. At the time when concealment of birth and evidence of the life of the child were allowed to form conclusive proofs of the commission of infanticide, the inquiry, *whether the child was born living or dead*, was of paramount importance;

and it is still one of considerable interest to the medical jurist and lawyer. The proof of the child having been born alive forms, in trials for infanticide, presumptive evidence in favour of the charge; whilst evidence of its having been still-born will confine the investigation to the proofs of death from criminal violence during parturition,—a species of child-murder commonly requiring the aid of an accomplice, and hence an infrequent form of infanticide.

The proofs of the survival of the child after delivery must be drawn from the phenomena of *respiration* and *circulation*, as it is chiefly by the performance of the former, and the changes which take place with respect to the latter, that the commencement and continuance of extra-uterine life are indicated. These phenomena relate principally to the *colour of the lungs*, their *consistence*, *specific and absolute weight*, and their *volume;* to the *contraction of the ductus arteriosus Botalli*, and its diameter in relation to that of the pulmonary artery and its two great branches.

1. *Colour.*—The colour of the fœtal lung is dark red, sometimes inclining to the brownish red of the liver, or the blueish red of the thymus; but in those parts of the lung in which respiration has had an influence, it is pale red or scarlet, unless they are gorged with blood, in which case it may be brownish or blueish red. From the experiments of Bernt (Experimentorum Docim. Pulmon. Hydrost. illustrantium Centuria I. curante Jos. Bernt, M. D., &c. Viennæ, 1823,) it results that artificial respiration in a dead child, if it changes the colour at all, causes a pale or greyish red tint. In children who have breathed imperfectly, or only for a short time, the lungs on the anterior surface are of a pale red, on the posterior surface dark red, whilst in different parts of the lungs patches of scarlet red are visible. In children who have breathed perfectly and lived a longer time, the lungs are pale red with numerous patches and stripes of cinnabar or scarlet red; posteriorly they present a dark red colour, owing to the subsidence of the blood.

2. *Consistence.*—The lungs, in the fœtal state compact, become from respiration looser and expanded. They are vesicular on their surface, and air-bubbles or froth may be squeezed out of them. These are circumstances to be determined by the touch and sight, and result from their mechanical distension by the air. Three sources have been enumerated, besides natural breathing, from which air found in the lungs may be derived, namely, artificial inflation, putrefaction, and emphysema. The two latter produce vesicles which are superficial, large, and irregular, and which may be pressed out; so that the fœtal lung will sink, which can never happen when the lungs have been distended by natural breathing or insufflation.

A general presumption only can be drawn from the consistence of the lungs. If they are soft and have a regularly vesicular appearance, respiration either natural or artificial must have taken place, and a reference to the other tests of independent life will show which of the two has happened.

[According to Dr. Guy (*Op. cit.*, p. 123,) the smallest quantity of air, received into the lungs by respiration or insufflation, serves to develop some of the air-cells on their surface, and these developed air-cells form the best proof of the admission of air in one of the two modes mentioned. The air-cells, thus developed, present, he remarks, an appearance not to be confounded with any other. If the lungs are fresh and filled with blood, the position of these developed air-cells is marked by brilliant vermilion spots; if the lungs contain less blood, the spots are of a lighter colour; and if they be examined some days after the birth of the child, they will be found to have lost their bright vermilion hue, and to have assumed a light rose colour. In the lungs of children who have survived their birth some days, the air-cells have very nearly the colour of those of the healthy adult lung.]

3. *Specific Gravity.*—It was known to Galen that the fœtal lung sank in water, but that after respiration it floated, and these facts form the foundation of the hydrostatic test. Swammerdam affirmed that the lungs would float if only one inspiration had taken place, in which assertion he has been followed by Haller, Daniel, and Dr. W. Hunter.

But subsequent experience has shown that the specific gravity of the lungs before and after birth does not observe an uniform ratio. It has been ascertained, first, that newly born children may live some time without respiration; secondly, that after respiration has been carried on for some time, the lungs are not uniformly dilated, and occasionally to so trifling an extent only; that they sink in water, or sometimes that the lungs are unequally dilated or diseased; and thirdly, that in some still-born children the specific gravity is less than that of water, which may arise from breathing before complete birth, from artificial inflation, or extrication of air through other causes; and objections to the conclusiveness of the hydrostatic test have been alleged for these several reasons.

a. It is a fact familiarly known to all obstetrical practitioners, that children occasionally do not breathe till they have been born for some time; but there are no means of determining whether a child found dead could have been animated had the proper measures been resorted to. And the proof that a child so circumstanced had been murdered must rest on the evidence of existing mortal injuries, which it was morally impossible could have been the consequence of accident, but must have resulted from criminal violence. In short the evidence of murder in such a case must be similar to the proofs of infanticide during parturition.

b. But the lungs may sink, although the child have breathed for some time, owing to their imperfect dilatation. Craanen (Commentatio de Infantum nuper natorum Umbilico et Pulmonibus, Auctore G. F. Daniel, Hallæ, p. 100,) described it as a frequent occurrence, and had the merit of pointing out how the fallacy might be obviated. He recommended that each lobe of the lungs be cut into small portions and thrown into water. If all sank, he inferred that the child died in utero; but if a few fragments floated, he concluded that the child had survived delivery. The imperfect dilatation of the lungs after respiration has been usually found in immature children, but cases have been related by Schenkius, Bernt, and others, of children born at the full time, and who had lived one or more days, whose lungs sank in water; and we recollect an example of the same kind which occurred to the late Dr. Wm. Cullen of Edinburgh; [and a similar case is related by Mr. A. Taylor, (*Guy's Hospital Reports*, No. V.)] The proceeding recommended by Craanen is, no doubt, applicable to all such cases; and the conditions of the ductus arteriosus Botalli and pulmonary arteries, to be hereafter noticed, would, in conjunction with other proofs, remove all doubts concerning the conclusiveness of the hydrostatic test in similar instances.

c. A diseased condition of the lungs may also prevent their floating after respiration, but it is extremely rare to find the fœtal lungs in such a state of disorganization as to admit so little air that the whole lung will sink in water. Such a pathological state must be quite conspicuous, and the proceeding recommended by Craanen would easily obviate the fallacy, for if life had been maintained at all, some portion would float.

d. Hoffmann, (Tom. vi. p. 213,) Bohn, (*Daniel*, op. cit. 108,) and Hutchinson, (Essay on Infanticide, 1820, p. 52,) have related examples of lungs which have sunk from congestion of blood in consequence of suffocation. The best informed pathologists, Meckel for instance, have doubted the possibility of such an occurrence; but the fact has been attested by the three authors just named. This is an objection to the hydrostatic test easily corrected, for after gently pressing out the blood, the lung will float. Thus, although the lungs may sink in a child which has outlived birth, the circumstances under which this may happen are known, and can be readily detected and allowed for.

It has been further observed that the lungs in children notoriously still-born will sometimes float, and the circumstance has been adduced as a ground of objection to the hydrostatic test. Such floating has been ascertained to depend, first on breathing before delivery, the child nevertheless dying before complete expulsion; and secondly, the lungs may be rendered specifically lighter than water by artificial inflation, by putrefaction, or by a species of emphysema, first noticed by Schmidt, (Neue Versuche und Erfahrungen, &c. S. W. Wien, 1806,) and subsequently more distinctly characterized by Chaussier. (*Lecieux*, op. cit.)

e. The possibility of uterine respiration was denied by all writers down to the time of Bohn. (*Daniel*, op. cit.) He first maintained, in 1700, that in *difficult labours* a child may draw in air enough to suffice for the distension and floating of the lungs, and yet die before delivery. Bredenoll has related a remarkable example in Siebold's Journal für Geburtshülfe, Band I. It was a case of twins; the first child had been delivered by the forceps, the membranes ruptured, and the hand introduced to turn the second, whom he heard distinctly to cry for at least a dozen times. Bernt has mentioned four somewhat analogous cases. In a child delivered by turning and destruction of the brain, every fragment of the lungs floated. (Edin. Med. and Surg. Journ. xxvi. 371.) Of the other three cases, two fœtuses were extracted after the mother's death, the vagina in the one and the neck of the womb in the other having been ruptured; and the third was extracted by the forceps on account of tedious labour. In these the lungs sank when entire, but many fragments floated, and in all the four examples every other test coincided with the hydrostatic to justify the inference that the children had respired. Until recently the evidence in favour of uterine respiration had been altogether supplied by German authorities; lately, however, Professor Marc has recorded an unequivocal example of the kind communicated to him by M. Henry, which has removed the scepticism formerly entertained on the subject by the learned professor, and others also we presume. A woman, having a deformed pelvis, and pregnant for the third time, was in labour on the 10th of October, 1827. M. Jobert was in attendance, and called in M. Henry to his assistance. Having ascertained that the deformity occasioned an obstacle to delivery, M. Henry observes,—"M. Jobert and I thought that it might be necessary to turn the child, but as the head did not appear to be very voluminous, we hoped to be able to disengage it by means of the forceps. That instrument was applied; and as soon as M. Jobert commenced the attempts at extraction, the fœtus uttered repeated cries during a dozen seconds, so distinct as to be heard by all the assistants. But as the head remained impacted in the pelvis, notwithstanding the efforts made with the forceps, we were obliged to desist from this attempt.

"Whilst we were discussing the necessity of turning the child, these cries were renewed as distinctly as on the former occasion, and in such a manner as could only take place in consequence of repeated inspirations. Finally, when introducing my hand to seize the feet, the moment it passed over the left shoulder the fœtus for the third time uttered cries, less prolonged than the preceding, yet sufficiently loud to be heard by all present.

"The delivery was completed with much difficulty, and the child did not breathe after its expulsion; but as the pulsations of the heart were pretty strong, we tried various means to resuscitate it, among others insufflation of the lungs Our attempts were fruitless, for at the end of some minutes the circulation had ceased. I regret that I cannot describe the state of the lungs, but as insufflation was practised, an examination of them could not have afforded precise and unexceptionable information." (Dict. de Médecine, xii. 154.)

But the case now to be related proves incontestably that these cries may be uttered by a child in utero, and subsequently born alive without assistance. It is described by Dr. A. F. Holmes, Lecturer on Chemistry and Materia Medica, Macgill College, Montreal. (Edin. Med. and Surg. Journal, No. cii. 215.) "On the 29th of November, 1828, I was called to a lady in labour of her sixth child. The fontanelle presented, but the pelvis being capacious, and her labours generally easy, no attempt was made to change the position. The head continuing to descend, the mouth lay on the pubis, and the examining finger could easily be introduced into it. The occiput did not yet occupy fully the cavity of the sacrum. At this time I heard sounds like the cries of a child whose mouth was muffled by some covering, but not being very distinct, and not being at all prepared for them, I thought, when they ceased, that they must have been produced by flatus in the intestines of the mother. In the course of a short time, however, the cries were repeated, and with the greatest distinctness, so as not to admit of a doubt that they proceeded from the child. The mother, much alarmed, inquired the cause of these noises, and required to be assured that they were not indicative of any danger. The pains being brisk, the head was soon forced down and expelled. The child was a female, and is still (August, 1829,) alive and thriving." [See, also, an undoubted case, on the authority of Dr. Collins, of Dublin, in his *Practical Treatise on Midwifery*, &c. Lond. 1835.]

The evidence for vaginal respiration is equally conclusive. Formerly Professor Marc (Manuel d'Autopsie Cadaverique, traduit par C. C. H. Marc) endeavoured to show that, from the compression of the fœtal thorax in the passages, it was impossible; but his reasoning must yield to the unquestionable testimony of Schmidt, Osiander, and Capuron, each of whom has witnessed it. In relation to infanticide it has been usual to disregard the vagitus vaginalis, as occurring only under circumstances which could not lead to doubt in the decision; either because it was only heard after the expulsion of the head, when there could be comparatively but little difficulty on the part of the mother, and as little danger to the child in the accomplishment of complete expulsion; or that it occurred in presentations of the face and feet, in which delivery could not be completed without great difficulty or foreign manual assistance, and was therefore not likely to occur in medico-legal practice.

The experience of practitioners will not completely justify this view. It is undoubtedly for the most part true, that when the head is expelled, the complete birth of the child is attended neither with difficulty nor danger; but the case related by Dr. Hosack (Beck's Med. Jurisprudence, p. 164) proves that a child *may* perish after the expulsion of the head and before complete delivery, and that in the interval it may breathe and cry. The editors of the London Medical and Physical Journal (Vol. lxii. p. 423) have observed a similar occurrence; and every practitioner of experience must have met with presentations of the face and feet, in which delivery has been completed by the unassisted expulsive efforts of the uterus. (Heath's Baudelocque, ii. 224.)

Uterine and vaginal respiration appear therefore to constitute a possible objection to the determination of the life of the child after birth, which may sometimes be insuperable. The correct objection to oppose to it, is the rarity of such a conjunction of circumstances as is indispensable for the occurrence; and the full expansion of the lungs, if present, would render such a plea more than doubtful.

The lungs may float from insufflation or artificial respiration, and Bohn (Beobachtungen und Abhandlungen von Osterrischen Aerzten, *u. s w.* iii. Band, S. 45) and Camper (*Daniel*, op. cit. p. 163) have quoted instances in which it had been successfully practised by blowing air into the lungs with the mouth. Schmidt (Neue Versuche, *u. s. w.*) has investigated the subject of artificial respiration, and established the facility with which it may be practised. According to his experiments crepitation is always present, and the distension of the thorax is permanent, but the ratio of the weight of the lungs to the rest of the body remains as in dead-born children. The results of the *static* test, the colour of the lungs, and the unaltered conditions of the ductus arteriosus Botalli and pulmonary arteries would distinguish insufflation of the lungs in a dead child from respiration, either natural or established artificially in a living one.

It is impossible to conceive, however, that a woman charged with infanticide, who had attempted to resuscitate her child by insufflation, could fail to produce satisfactory proofs of her innocence; for it may be reasonably presumed that a child subjected by a mother to such an attempt would not exhibit any signs of criminal neglect or wilful ill-treatment, whilst the attempt to inflate the lungs would form a presumption in favour of the accused. Morgagni (De sedibus et morborum causis, Epist. xix. art. 47) and Dr. W. Hunter have suggested that insufflation may be practised by another person from a malicious motive towards a mother; but were such an apparently incredible occurrence to happen, the results of the other indications of life would demonstrate by what means the lungs had been expanded.

"Medical jurists," says M. Devergie, (Dict. de Méd. et Chir. pratique, vi. p. 345, [and Méd. Lég.,]) "have endeavoured to represent the inexpediency of drawing positive conclusions from the evidence under consideration, by alleging that a woman may have inflated the lungs of her own child for the purpose of restoring it to life; or that another person may have done so from a criminal motive towards the mother. Such observations are just, but a multitude of cases occur where the circumstances in which the body of the child and the author of the crime are found, totally exclude them from consideration. For example, a child has been thrown alive upon the ice of the Seine, undoubtedly *living* at the time, for it presents all the signs of injury which can result from such a fall; another is found in the water, inclosed in a bag firmly sewed up; a third is thrown into the street, the mouth and pharynx filled with linen, so as to produce suffocation; a fourth floats on a river inclosed in a paper box, and so enveloped in linen as to prevent the access of air; a fifth has been thrown into a privy; a sixth dismembered and buried in an unfrequented situation. Certainly none of these proceedings could have been the act of a mother who had practised insufflation in order to restore her child to life, nor could it be attributed to a person, who, having wickedly simulated a crime, would have an obvious motive in proclaiming its apparent existence."

[M. Devergie (*Méd. Légale*, 2de édit. art. INFANTICIDE, Paris, 1840) affirms that in many cases he could determine, whether the distension of the lungs with air had been the effect of respiration or of insufflation. In the case of air introduced by respiration, he states, there is a minute injection of capillary vessels on the surface of the air-cells, which injection does not take place in the case of insufflation. It is properly remarked, however, by Dr. Guy, (*Op. cit.*, p. 125), that although this distinction may be well founded, it deals with parts so extremely minute, and according to M. Devergie's statement is to be relied on only in *many*, but not in *all* cases, that it may be fairly set down as unfit for the use of those who have not taken the pains to examine the lungs carefully and minutely for themselves; and he adds, that there is one case in which the distinction laid down by M. Devergie would entirely fail; that is, where lungs that have respired contain but a very small quantity of blood; in such case, the capillary vessels would, in all probability, present no strong signs of injection.

It has been affirmed, too, of late years, (Mr. Alfred Taylor, *Lond. Med. and Phys. Journ.*, Nov., 1832, and Jan. and May, 1833; and Mr. Jennings, *Transactions of Provinc. Med. and Surg. Association*, for 1833,) that if air be introduced into the lungs by insufflation, it may be always forced out by pressure, so that the lungs will sink; whilst no pressure will force the air from lungs that have respired. It would seem, however, that the test does not distinguish imperfect respiration from imperfect insufflation; and on the other hand, the experiments of Dr. Guy (*Op. cit.*, p. 138,) would seem to have proved that lungs completely distended by insufflation, cannot be made to sink by a degree of pressure short of that which will destroy the texture of the lung; and that lungs so distended with air differ from those which have breathed completely only by requiring somewhat more pressure to make the latter sink; and he infers from his experiments, that where portions of lungs that have been inflated are submitted to the same amount of pressure with portions of lungs that have respired, the only difference observable is one of *degree*, the inflated lung, like that of the lung which has breathed, not sinking until its texture is destroyed, but a less amount of destruction being necessary in the former than in the latter.]

An objection to the hydrostatic test has been drawn from the putrefaction of the lungs, and the consequent floating from the air thus disengaged. Although this is an objection of very little practical importance, it has occasioned much controversy. Heister, (*Bernt*, in Abhandlungen und Beobachlungen, S. 56,) in 1722, observed the lungs of a child which had died in the womb, to float both whole and in pieces, and the known circumstances of the case proved that insufflation could not have been practised. Haller (*Bernt*, Abhandlungen und Beobachlungen, S. 56) instituted experiments on the subject. He allowed the lungs of a dead-born child to become putrid in water, and saw them float after seven days in the same water. The colour was changed from dark to light red, and they were covered with air-bubbles. A dark-red compact-feeling lung out of another body, already powerfully offensive, sank both entire and in pieces. He concluded, therefore, that considerable putrefaction was necessary to cause the floating of the lungs. Camper had previously made the same remark, and had found that, when the whole body was so far advanced in putrefaction that the joints separated with the slightest touch, the lungs had only begun to decay, and would not float in water. Jaeger, from experiments and observations on the difference between sound and putrid lungs, drew the following conclusions: a lung which floats from putrefaction is distinguished from one which does so from breathing, by the situation of the former against the spine, by its dark red colour, and by the air being found under the outer membrane in the form of bubbles, (See *Hunter*, Med. Observations and Inquiries, vol. vi. p. 284,) and by the easy escape of the air after cutting into the lungs and the subsequent sinking of them. The air developed by putrefaction he found to escape with much facility by means of incisions and gentle pressure; not so in those which floated from respiration. Mayer (Schlegel's Collectio Opusculorum, vol. i.) also engaged in an extended series of experiments on the putrefaction of the lungs. He found that on placing the lungs of still-born children in water, in the course of two or three days their colour changed, and they increased in volume. By the eighth day at latest they floated, both whole and cut into pieces, in the water in which they became putrid, but, transferred to clean water, although they still floated, yet on the slightest compression they sank. The rays of the sun accelerated the putrefaction, but a current of air retarded it, so that they did not float until the tenth or eleventh day. After having once floated, they continued to do so, emitting daily a more offensive odour and acquiring an increased volume, until the twenty-first or at latest the thirty-fifth day. After that period they gradually sank down, without a single exception, to the bottom of the vessel, nor did they afterwards in the least float, although kept for seven weeks or even longer. Beck (Medical Jurisprudence, p. 157) and Orfila have confirmed these results of Mayer, to which M. Devergie has added the following interesting practical correction. Referring to the above experiments, M. Devergie observes, (Dict. de Méd. et Chir. prat. vi. p. 342, [and Méd. Lég.)] "Although the above experiments appear incontestable, an accidental circumstance may completely change their results, so true is it that practical deductions drawn from experiments are frequently liable to error. In the number of the Annales d'Hygiène et de Médecine Légale for Oct. 1830, I published two cases of infanticide submitted to my examination, in which putrefaction of the lungs with development of gas was evident. The children had been thrown into the Seine, remained in the water seven or eight days, and subsequently exposed to the air from twenty-four to thirty-six hours before being opened.

"It is ascertained that, whenever a person drowned is taken out of the water after having been submersed for ten or fifteen days, if the temperature of the atmosphere ranges between 15° and 25°, a considerable development of gas takes place in the body immediately on its exposure to the air. In consequence of this disengagement of aeriform fluid, which takes place not only in the subcutaneous tissue, but even in the internal organs most protected from the agency of the atmosphere, the fluids of the body are conveyed to the surface, bullæ are formed, sanies exudes from the cutaneous pores in general, and escapes also by the natural openings. In a great number of bodies the development of putrid gas is so considerable as to effect an alteration in the posture of the limbs, and even to change the general position of the body. Thus, it has been found necessary to secure the bodies, publicly exposed at the *Morgue*, to the tables on which they are placed. Before this precaution was adopted, the bodies occasionally fell to the ground; and strangers frequently hastened to inform the porter that an individual placed there was not dead, for they had seen him move.

"The phenomena observed in the body of an adult found drowned, develop themselves with equal or greater rapidity, under the same circumstances, in the fœtus. Now it is very rare that a medico-legal examination of a body takes place, before the *procureur de roi* (in England the coroner) has been informed of it; hence at least twenty-four hours generally elapse, during which period the body is undergoing the changes indicated above, and the lungs become as emphysematous as possible."

We have said enough, however, to show that air developed in the lungs by putrefaction must be an extremely rare event, that it is easily recognised, and any fallacy arising from it readily avoided.

Alberti (*Daniel*, op. cit. p. 120) in 1728 threw out a hint that the lungs sometimes contained air which was derived neither from putrefaction nor respiration. In 1806, Schmidt (Neue Versuche, *u. s. w.*) confirmed the observation, remarking that bubbles of air appear in the lungs which do not betray the least trace of putrefaction, and that they are thereby rendered capable of floating. The same phenomena occurred to the observation of Chaussier, (*Lecieux*, p. 56,) who suggested the following method of obviating the fallacy: "In these instances," says he, "the aeriform fluid is contained in the cellular tissue of the lungs, whence it may be expelled by pressure, after which the lungs thrown into water immediately sink. This does not happen if the air was contained in the minute air-cells."

The preceding observations include all the objections alleged against the conclusiveness of the hydrostatic test as a proof of extra-uterine life. If we except the rare and barely possible occurrence of uterine or vaginal respiration, it must be evident to every candid mind that these objections possess neither conclusiveness nor force; and that the circumstances on which they depend can be so easily and fully appreciated as to avoid any error which could lead to the crimination of the innocent. Of the considerations to be opposed to the vagitus uterinus we have already spoken, and shall again advert to them before the conclusion of this article.

4. *The difference between the weight of the lungs before and after natural respiration.*—This constitutes the *static test* first proposed by Ploucquet* in 1777. Experience, however, soon showed that this test was limited in its practical application, since, in some children who had lived several days, the weight of the lungs proved to be less than that frequently observed in still-born children.

[The recent experiments of Dr. Guy (*Lond. Lancet*, Oct. 1, 1842, and *op. cit.*) have shown in a signal manner the limited application of the absolute weight of the lungs as a test; for, of 34 cases, there was not a single one in which it could have been pronounced, by means of this test alone, that respiration had or had not taken place; whilst in two instances the great weight of the lungs would have led to the inference that respiration had been effected, although the children were still-born.]

It was, therefore, suggested to substitute as a criterion, the *relative* weight of the lungs, before and after natural respiration, to the whole body. But the experiments and observations of Chaussier, Schmidt, and Bernt, have shown the inutility of this modification of the static test, by pointing out that in many still-born children the ratio was a lower one than the average for children who have breathed, and vice versâ. Schmidt, seeing therefore that this method was not an improvement, proposed to return to the original mode of judging by the *absolute* weight of the lungs, and to confine the application of the static test in this form to those cases in which the weight is such as is never attained by the natural and healthy *fœtal* lung. In twenty-four still-born children examined by Bernt,† the greatest weight of the healthy lungs was 993 grains, and he states the medium at about 550 grains. The form of the static test recommended by Schmidt is very limited in its application for the lungs of children who have outlived delivery; not more than one in six or seven equal their former weight. When the fœtal lungs, being naturally formed and of healthy structure, exceed 1000 grains, such weight may be considered as constituting decisive proof that the floating of the lungs and their loose and expanded appearance do not result from insufflation practised on a dead child, but must be a consequence of the continuance of respiration and of the circulation of blood through them, and therefore of life; and even if the weight exceed in any considerable degree 550 grains, the same inference is a reasonable presumption.

5. *Size of the Lungs.*—As respects the volume or circumference of the lungs, it is observed by Bernt (Handbuch, 266) that naturally formed and healthy fœtal lungs which have not respired, occupy the posterior part of the thorax, merely touching the pericardium with their anterior borders. The posterior half only of the arch of the diaphragm is covered with them: the edges are sharp, the margins of the right, middle, and left upper lobes forming small pointed, tongue-shaped elongations. If, however, the child have lived a very short time after birth, and breathed only imperfectly, the lungs are found to occupy the lateral parts of the thorax also; their anterior borders and the tongue-shaped elongations of the right, middle, and left upper lobes are become round either partially or altogether. After full and complete respiration the lungs entirely fill the lateral cavities of the thorax; their anterior borders cover the sides of the pericardium, and their concave surface the whole arch of the diaphragm; their borders are everywhere rounded, and the tongue-shaped prolongations of the right, middle, and left upper lobes are short and obtuse.

6. *State of the Ductus Arteriosus.*—Passing

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* Abhandlung über gewaltsame Yodesarten, L. 153—156.

† Experimentorum Docimasiam, &c. Edinburgh Medical and Surgical Journal, p. xxvi. p. 375. Handbuch der gerichtlich. Arzneikunde, u. s. w. von J. Bernt. Wien. 1898, s. 256.

over the changes which take place in the foramen ovale, the ductus venosus, and umbilical vessels, changes which take place at too late a period after birth to supply satisfactory evidence in trials for infanticide, we come to the consideration of the comparative state of the ductus arteriosus Botalli, and the branches of the pulmonary artery before and after respiration. Previous to the investigation of Bernt no minute observations had been made on the changes which these vessels undergo soon after delivery. It might have been anticipated that the occlusion of the ductus arteriosus must be rapid, since its perviousness would form an impediment to the perfecting of the child's new mode of existence; but it had not occurred to medical jurists to seek for any indication of extra-uterine life from this source.

In the fœtus the ductus arteriosus proceeds from that part of the trunk of the pulmonary artery where it divides into its two great branches, and running parallel with the arch of the aorta and in contact with it, joins it at a very acute angle. It is about half an inch long, cylindrical, equal in diameter to the trunk of the pulmonary artery, and almost three times the diameter of its two branches, each of which branches is about the thickness of a crow-quill. (Experimentorum Docimasiam, &c. Proleg. p. xiv. Handbuch, 377.)

If the child, says Bernt, have breathed for a few moments only, the aperture by which the duct enters the aorta becomes oval; if a little longer, it loses its cylindrical form, and assumes the shape of a cone, the apex being at the aortal end, but sometimes, though much more rarely, at the opposite extremity; the diameter is diminished so as to be smaller than that of the trunk, but about equal to that of the two branches of the pulmonary artery, the latter, owing to the establishment of the pulmonary circulation, having already increased in diameter.

If the child have lived for some time, and breathed perfectly, the ductus arteriosus Botalli resumes the complete cylindrical form, but has become shorter, and is not thicker than a crow-quill, whilst the two pulmonary branches are thicker than a goose-quill. As these comparisons are determined by the relative size of objects situated close to each other, an observer would not be liable to fall into error, as he is otherwise apt to do in estimating relative magnitude. (Edinburgh Medical and Surgical Journal, vol. xxvi. p. 378.)

The observations and experiments on which the preceding inferences relative to the blood-vessels are founded, were made previous to the year 1823; and in the Manual of Medical Jurisprudence published in 1828, Professor Bernt adheres to the same conclusions, and informs us that they have been confirmed by the observations of Kilian (Abhandlung über den Kreislauf des Blutes im Kinde welches noch nicht geathmet hat, Karlsruhe, 1826), a writer of authority on the fœtal anatomy. As we have attentively examined these observations and experiments, which are seventy-five in number, and not been able to concur with Bernt in his inferences in every particular, we shall briefly state those which appear to be conclusive, and of practical application in medico-legal inquiries.

In every instance of respiration whether naturally accomplished or the effect of resuscitation from insufflation, a general or partial diminution of the diameter of the ductus arteriosus was found. But a diminution in general diameter (so that the natural relative diameter between the ductus arteriosus and the trunk and branches of the pulmonary artery did not exist) was sometimes found in children notoriously still-born, and who had not breathed artificially; hence a smaller relative diameter of the duct cannot be relied on as a proof of extra-uterine life. But the contraction of the extremity (either aortal or otherwise) of the duct, though sometimes absent in children who had respired, was never present unless respiration had been carried on; so that, if the ductus arteriosus represent a cone in figure, it may be regarded as a decisive indication of the continuance of the pulmonary circulation, and hence of breathing.

[It may be desirable to cite from M. Devergie (*op. cit.*) the various changes that take place in the organs of circulation, the cord, and the skin, at different periods, beginning with the first and ending with the thirty-fifth day, which may enable some judgment to be formed of the age of the child.

First day.—Cord beginning to wither; foramen ovale, ductus arteriosus, ductus venosus, and umbilical vessels open.

Second day.—Withering of the cord complete; foramen ovale closed in two out of eleven cases; partially closed in one out of seven; ductus arteriosus beginning to close; umbilical arteries obliterated to a greater or less extent; umbilical vein and ductus venosus still open.

Third day.—Desiccation of the cord; foramen ovale sometimes closed; ductus arteriosus obliterated in one in eleven cases; umbilical arteries very often obliterated; umbilical vein and ductus venosus still open.

Fourth day.—Cord beginning to fall off; foramen ovale closed in about one-third of the cases; ductus arteriosus still open in the majority of cases; umbilical arteries closed, but sometimes open near the iliacs; umbilical vein and ductus venosus much contracted.

Fifth day.—Separation of the cord with rare exceptions; foramen ovale closed in more than half the cases; ductus arteriosus closed in about half the cases; umbilical vessels closed; vein occasionally open; separation of the cuticle advanced.

Eighth day.—Entire separation of the cord, with commencing cicatrization; foramen ovale closed in three-fourths of the cases; ductus arteriosus completely obliterated in half the cases; vessels closed.

Ninth to eleventh day.—Cicatrization of the umbilicus often complete; sometimes, however, there is an oozing of mucus from the cord for many days, so that the cicatrix is retarded; separation of the cuticle in the trunk, chest, and abdomen, and at the articulations.

Twentieth to twenty-sixth day.—Separation of the greater part of the cuticle.

Thirtieth to thirty-fifth day.—Separation of the entire cuticle, excepting that of the hands and feet, which is often delayed until the 40th day. (See, on the same subject, Billard, *Maladies des Enfants*, and Guy, op. cit. p. 149.)]

Having now investigated the evidences of independent life, which may be supplied by the examination of the body of a child found dead, we proceed to arrange the inferences of practical value in a compendious form. The state of the stomach, bowels, and urinary bladder, and of the umbilical cord, has been purposely omitted, as in a large majority of cases they do not furnish any indications which can be relied on.

First.—A child may be concluded to have been still-born who does not present the signs of having arrived at the sixth month of uterine life: or

The colour of whose lungs is uniformly dark-red, or verging towards the brown-red of the liver or the bluish-red of the thymus:

If they are of a fleshy compact structure, somewhat like liver, presenting no traces of cells on the surface, nor yielding a crepitating sound when cut, nor bubbles of air when portions of them are pressed beneath the surface of water:

If the whole lungs and every fragment when they are cut into small pieces immediately and rapidly sink in water; and when the weight of the whole lungs (being naturally formed and healthy) is below five hundred grains:

If the lungs have occupied the posterior cavities only of the thorax, merely touching the pericardium with their anterior borders, and covering with their concave surface the posterior half of the arch of the diaphragm, the edges being sharp, and the margins of the right, middle, and left upper lobes forming small tongue-shaped elongations: and if the ductus arteriosus is cylindrical throughout, being of equal diameter with the trunk of the pulmonary artery, and two or three times the diameter of the two pulmonary branches.

Secondly.—It may be concluded that a child has lived a short time and breathed imperfectly,

Whose lungs being for the most part dark-red, brownish, or bluish-red, present, here and there, in one or both lungs, but particularly on the edges, insulated scarlet or cinnabar-red spots or streaks; when there are visible, particularly in the upper lobe and edges of the right lung, insulated groups of cells surrounded by portions retaining the compactness of liver; when this cellular portion yields a crepitating sound on being cut, and bubbles of air if pressed under water; when the lungs occupy more or less the lateral cavities of the thorax, and their margins, particularly the prolongations of the right middle and left upper lobes, are partially or altogether of a rounded form:

When the lungs, with or without the heart, sink in water, but some fragments of them, when divided, float, even after having been subjected to pressure; and when the absolute weight of the lungs much exceeds five hundred grains:

If the ductus arteriosus is smaller in diameter than the pulmonary trunk, and about equal to the pulmonary branches, and particularly if with these signs it is contracted either at the aortal or other extremity, so as to assume a somewhat conical shape.

Thirdly.—A child may be concluded to have lived for some time and breathed perfectly,

If the lungs are of a pale-red colour generally, but with numerous spots and streaks of scarlet; the posterior surface only being dark-red, in consequence of the gravitation of the blood to that part:

If the lungs completely occupy the lateral cavities of the thorax and cover the sides of the pericardium, and if their lower concave surface cover the whole arch of the diaphragm, their edges being everywhere rounded, and the tongue-shaped elongations of the right middle and left upper lobes short and obtuse: if insulated groups of innumerable cells distended with air are visible with the naked eye in the substance of the lungs; if they are everywhere expanded and spongy in texture, crepitating audibly when cut, and yielding on pressure under water, numerous bubbles of air or bloody froth:

If the lungs connected with the heart, or separated from it and each separate lobe, project above the surface of the water, and every fragment when they have been divided and subjected to strong pressure, float; and if their absolute weight exceed one thousand grains:

And if the ductus arteriosus is short and much contracted in diameter, so as to be as small as or smaller than the branches of the pulmonary artery; or if it be decidedly contracted at the aortal or other extremity, so as to represent in form a truncated cone.

To every indication, hitherto adduced, of the extra-uterine life of the child, the possible occurrence of uterine or vaginal respiration presents an objection which deserves farther consideration. In the preceding remarks we have adverted to cases of this kind, which refute the opinion hitherto entertained that this species of respiration cannot come in the way in medico-legal investigation, because it can only occur in cases requiring instrumental or, at least, foreign manual assistance. Although there can be no doubt of the general correctness of this opinion, it is manifestly not true in all instances; for the cases of Dr. Hosack and Dr. Holmes (see page 681) prove that it may be met with in instances of delivery capable of completion by the natural efforts only.

Admitting, however, the possibility of intra-uterine and vaginal respiration, we must contend on the other hand for the extreme rarity of the occurrence; so rare, indeed, that, until very recently, it has been regarded with the greatest distrust by European practitioners in general with the exception of the Germans: and it is doubtful whether any other positive evidence than that recorded in the present essay, exists in the writings of French and English authors in its favour. Ought, then, so rare an occurrence to be admitted as a decisive reason for uniformly rejecting the conclusiveness of the indications of life which we have hitherto been discussing? We think not, and doubt extremely whether the signs of *perfect* respiration which we have just detailed are ever to be met with in such cases; whilst we have every reason to believe that they are commonly found in the bodies of children who have died from criminal violence or neglect.

Vaginal respiration may occur in natural presentations, but the delivery in such a case must be *delayed* to admit of it, and thus the labour would become "difficult." In every such case the tumour of the vertex would plainly indicate its nature. Face presentations, in which vaginal respiration may occur, are capable of proof from the absence of the tumour just named, and from the tumid and distorted features; and footling presentations are recognisable, if death have taken place soon after birth, by signs not difficult of detection. Such are the cases most favourable to the possible occurrence of vaginal respiration; and although they demand full consideration, they seem nevertheless capable on careful inquiry of tolerably easy detection. Should there be no proofs of difficult labour, whilst indications of full and complete respiration are found, and conjoined with these there exist signs of fatal injury, which could not have been accidental, and must have been inflicted during the continuance of the circulation, the proofs of infanticide would be indubitable; for to reject them would be to disallow the force of the strongest circumstantial evidence.

II. In proceeding to inquire into the *cause of the death of the child*, we may remark that it may have died in the womb previous to the commencement of labour; or during the act of parturition, or after birth; and in each case death may have been produced by natural or criminal causes.

1. The death of a fœtus in utero criminally induced in the early periods of utero-gestation, falls under the head of criminal abortion; at a later period death arises most frequently from natural causes, from disease in the mother, in the fœtus itself, or in the secundines; but it may result from premature labour brought on artificially by puncturing the membranes.

A fœtus having died in utero, may remain there an indefinite time, and even be converted into adipocire. Generally it is expelled in from five to twenty days, exhibiting unequivocal signs of putrefaction; the members are relaxed, the muscles flabby, the epidermis detached by the slightest touch, the skin is of a purplish or brownish-red. Frequently there is a sanguineous or serous infiltration of the whole subcutaneous tissue, particularly under the hairy scalp. The umbilical cord is thick, soft, brittle, and infiltered. The chest is sunken or flattened. The head is deformed, falling flat by its own weight; the pericranium and dura mater are separated from the bones, which are nearly, if not altogether, disunited, and the cerebral substance is converted into a putrilaginous mass. Jaeger observes that these signs are quite peculiar, and that their concurrence distinguishes this state from death by injury, and every thing else. (*Schlegel*, Opuscul. Collectio V. 48. *Lecieux.*)

2. Capuron, (La Médecine Légale relative à l'art des accouchemens,) who has given the best summary of the causes of death during parturition, has divided them into innocent and criminal.

Of the former kind are difficult labour with premature evacuation of the liquor amnii; total or partial separation of the placenta; premature expulsion of the funis; presentation of the feet; detention of the body from mal-position after the expulsion of the head; and the "entortillement," or turning of the funis around the neck of the child.

The effects on the child of difficult labour with premature evacuation of the liquor amnii, are such as result from severe and continued pressure; and the death of the child takes place in the way of apoplexy. The signs which indicate it are the sero-sanguineous tumour of the vertex; if the head have presented, deformity and elongation of the head, attended even with fractures of the bones, tearing of the membranes, or separation of the pericranium, and effusion under it. (*Fodéré*, iv. 503.) The position of the injuries of the head, and the absence of any distinct sign of impingement from a bruising body, combined with the absence of the signs of respiration, would satisfactorily elucidate these phenomena.

In the case of total or partial separation of the placenta, the death of the child is of course from hemorrhage, and the body would present the signs of anæmia. It might be confounded with death from hemorrhage from the umbilical cord; but the absence of the signs of respiration would be a decisive means of discrimination. The mother would also present signs of anæmia.

In premature expulsion of the funis, the death of the child is from asphyxia. No sign of injury would be present, nor would there exist any proof of respiration.

Presentation of the feet, with all but the head expelled, and the delivery tedious: in such a case a woman might assist herself, and in so doing inflict so much injury on the child by her injudicious attempts, as to excite strong suspicion against herself; and the more particularly, as this is a conjunction of circumstances under which vaginal respiration may occur. Such a case would require a circumspect observation of all the particulars; but there are circumstances which could scarcely fail to lead to its correct elucidation. The indications of difficult delivery and of the presentation of the feet would be easily observed, and an examination into the situation and nature of the injuries would show whether they were of a kind which a woman might be expected to inflict on her child in promoting her own delivery. If death were not the result of injury, it would take place in the way of apoplexy, and the corresponding signs would be found.

In retention of the body from mal-position or otherwise after the expulsion of the head, death results from asphyxia, from the compression of the funis, if the child have not breathed; and if it have, from impediment of the free expansion of the thorax. In the former the absence of the signs of respiration, with the want of proof of criminal neglect or violence, would rebut the charge of infanticide; in the latter, imperfect respiration would be recognised by its appropriate indications, the severity of the labour would be proved by the tumour of the vertex, and other signs, and the want of proof of criminal act or intention would render the charge of murder untenable.

The only other innocent cause of death during parturition deserving of particular attention, is the "*entortillement*," or turning of the funis around the neck of the child. If this circumstance lead to fatal consequences, it is either by inducing apoplexy or asphyxia, according as respiration have or have not been carried on. Should any sign of injury be left, it will consist of a spiral impression, or (if the cord have passed round more than once) of the circular and spiral line discoverable on the neck. The epidermis is never puckered, nor the cartilages of the trachea injured. If it were alleged that the cord have passed round the neck more than once, it should be ascertained whether it was sufficiently long for that purpose.

It is proper to add that fractures of the bones sometimes take place in the uterus, of which Chaussier (Bulletin de la Faculté de Médecine, tom. iii. See also Otto's Handbuch de Pathologischen Anatomie, 394) has related a remarkable instance. In this example each of the long bones presented one or more fractures, some of which were recent, others beginning to unite, and others had unitnd.

The criminal causes of death during parturition are various, and for the most part evidently betray the intention with which they were employed. They almost always imply the aid of an accomplice, and hence are of comparatively infrequent occurrence. Of these the following are the most usual:—puncture of the brain through the fontanelles or sutures, or of the spinal marrow between the first vertebra and the occiput; torsion or compression of the head; detruncation; strangling and suffocation.

Belloc (Cours de Méd. Lég. 101) has reported an instance of child-murder in which the brain was punctured through the interior fontanelle. The external wound did not exceed half a line in length. On examination it was discovered that it penetrated the brain to the depth of two inches. At this point the cerebral substance was lacerated in several directions. Blood was effused both between the membranes and in the left lateral ventricle. Gui-Patin, Alberti, and Brendel have cited similar examples; and in the article Acupuncture in this Cyclopædia, reference is made to a trial in the "Causes Célèbres" for the same horrible offence. It is doubtful, however, whether these means would prove so rapidly mortal as to destroy life before the expulsion of the child. In the case related by Belloc, death appeared to have been produced by suffocation, the laceration of the brain not having been effectual.

In torsion of the neck the injury inflicted on the spinal marrow might be immediately fatal. The marks of violence presented by the ligaments of the vertebræ and neighbouring muscles would indicate the nature of the case; and it is highly probable that the marks of the pressure of the fingers would be visible.

Foderé (Vol. iv. p. 524) has related the trial of a widow, who destroyed her child in the act of parturition, by compressing its head between her thighs till it was dead.

It is doubtless possible that a child may be strangled or suffocated before complete respiration has taken place; but the nice accomplishment of such a purpose requires a more refined application of injury than is almost ever practised; and without such caution the remains of intentional injury would be demonstrable. If strangulation were attempted whilst the circulation was proceeding vigorously between the mother and child, *continued* pressure would be necessary for its accomplishment, as death would take place in the way of apoplexy; and for such continued pressure a longer intermission of the uterine pain would be required than is usually found to occur.

3. The causes of death after delivery are natural or criminal; and the latter are subdivided into those which are fatal by omission and by commission.

The following is a general summary of the natural causes of death after delivery: immaturity, disease, malformation; omission of the usual and necessary attentions; injuries from severe labour or from sudden expulsion; sudden and simultaneous expulsion of the placenta, and consequent hemorrhage; prevented respiration from envelopment in the membranes; or suffocation in the discharges. The two causes last enumerated are not distinguishable from the same causes of death intentionally applied. Of the others, injuries from severe labour and from sudden expulsion are most likely to be confounded with the effects of criminal violence, and hence demand the most careful and deliberate examination. With reference to the former, it should be recollected that "fluid blood effused at the base of the brain is met with in all children, when the head *has been long* in the pelvis, and the child has died in that situation." (*Foderé,* iv. p. 503.) The cerebral ventricles of newly-born children, Foderé adds, usually contain much reddish serum, and the brain much blood. And when the superior aperture of the pelvis is narrowed by deformity, even fractures of the bones may occur with depression of them into the brain. But all these effects require for their production a disproportion between the size of the head and dimensions of the pelvis. The state of the former should indicate the difficulty of the labour by its deformed and elongated appearance, and by the unusual size of the sanguineous tumour at the vertex. Signs of laceration and contusion ought not to exist.

Injuries arising from sudden expulsion are very rarely fatal, or even dangerous; and they are less likely to be confounded with the causes of infanticide, inasmuch as they are of infrequent occurrence in first labours, on which occasions the crime is for the most part perpetrated. No instance of the death of a child from sudden expulsion has come within our knowledge. Suffocation in privies under such circumstances is of course possible, and Hutchinson (Dissertation on Infanticide) says instances are reported; he has not, however, supplied any reference to them. Several years ago Chaussier (*Lecieux,* Op. cit.) experimented on dead children to ascertain the effects of falls from a given height, and also of blows, on the cranium. These experiments, neither very refined nor conclusive in their character, are superseded by the more recent observations of M. Klein (Dict. de Médecine, tom. xii. p. 188) of Stutgardt. M. Klein, taking advantage of his situation of Member of the Superior Council of Health, caused a circular to be addressed to the midwifery practitioners of the kingdom of Wurtemburg, requiring reports of the cases of sudden expulsion of the fœtus which might be observed by them. Returns were made of one hundred and eighty-three cases. Of these, one hundred and fifty-five children were expelled whilst the mothers were in the upright posture, twenty-two when sitting, and six when on the knees. Twenty-one happened at the first labour. Of the whole number not one child died; no fracture of the bones took place, nor any other severe injury. Two only suffered temporary in sensibility, and one an external wound with sugillation over the right parietal bone. Not one suffered from umbilical hemorrhage, although in several the cord was ruptured at four, three, and two inches, and even one inch from the umbilicus. In twenty-one children it was torn off close to the abdomen, yet no serious hemorrhage followed. We are entitled, therefore, to conclude that in accidents of this kind the death of the child, if not impossible, is highly improbable; and if it should occur, we have no reason to think that it would be immediate.

The criminal causes of death *by omission* are, the neglect of removing the child from under the bed-clothes, or from the state of supination; the want of suitable warmth; neglect of nourishment; and the neglect of the ligature of the umbilical cord.

Death has resulted not unfrequently from the first of these causes; but the medical man possesses no peculiar means of determining whether this has happened from design or from the mother's inability to render the usual succours. Dr. William Hunter has mentioned a case which shows how readily neglect of this kind may prove fatal.

Death from want of suitable warmth, which is almost always conjoined with public exposure, is proved by the evidence of respiration and circulation; by sanguineous congestion in the large vessels, with comparative absence of blood in the superficial ones; by the position of the body; and most conclusively perhaps by the *cadaveric congestion* or *lividities* (*Chaussier*, Recueil de Mémoires, &c., 424) which are met with in the depending parts of the body.

Neglect of nourishment is also generally combined with public exposure; under which circumstances death may be attributable to the combined causes. It would be very difficult to prove the death of a newly-born child from neglect of nourishment only, because to establish that it would be requisite to show how long the child had lived, which there are no means of determining with strict accuracy. The changes supervening in the umbilical cord would furnish the best evidence; and being applicable on other occasions, we shall describe them in this place.

The umbilical cord varies in different children considerably, (Traité des Maladies des Enfans, &c., par Billard, p. 18): in some it is slender and comparatively firm, in others thick and soft; the thickness varying from the greater or smaller quantity of the albuminous fluid, called the gelatinous fluid of Warton. The changes which take place in the cord are, first, flabbiness, then desiccation, and lastly separation from the abdomen; and all these processes occur at different periods of time in different children, according to the thickness or thinness of the cord. Immediately after birth, or at farthest in a few hours, the flabbiness commences, and it is complete in the course of a day, or at most in two days. Desiccation, which commences after the fading of the cord is complete, begins generally at the end of the first day, and is completed on the fourth or fifth, when the separation takes place. The desiccation is a purely physiological phenomenon, for it does not take place in children born dead; in them the cord remains soft and flexible, and then becomes putrid. The desiccation of the cord is more speedy when it is thin; and it is rare that separation of a slender funis is attended by suppuration, or even inflammation. When it is thick, the case is otherwise; suppuration at its junction with the abdomen takes place, with a red and thickened base. The slowness of the separation appears to occasion the inflammation.

A consideration of these circumstances will indicate the age of a child approximatively within the first four or five days after birth.

The neglect of the ligature of the umbilical cord may be accidental or intentional. The absence of it is unfavourable to the accused, and more particularly if the funis be cut. The effects of the absence of the ligature of the umbilical cord have been a fruitful source of controversy; many, Capuron among others, having doubted whether fatal hemorrhage could result if the ligature were not applied. (*Daniel*, Commentatio de Infantum nuper natorum Umbilico, &c., 1780.) Foderé (Tom. iv. p. 516) has related a case which we deem quite conclusive in the affirmative; and the signs he has described will no doubt be generally met with under similar circumstances. They were the following: — extreme paleness of the whole body; no wound or external sign of violence; the umbilical cord flaccid; floating of the lungs with or without the heart; complete vacuity of the heart and great vessels, of the vena portarum, of the ductus venosus, and even of the capillary vessels. All the blood which could be collected did not weigh two ounces. The child lived long enough to be carried three leagues; hence death from this cause is not speedy, and the signs of respiration would be certainly found.

Rœderer has remarked that the ligature may be applied to the cord after fatal hemorrhage for the purpose of deception, but the proofs of anæmia would elucidate the case. If three ounces of blood can be collected, it may be presumed that the child has not died of hemorrhage. In Foderé's case, not two ounces could be collected.

We now pass to the consideration of the causes of death after delivery *by commission*; and it is commonly in this manner that infanticide is perpetrated in this country. They may be as various as those of homicide generally; but there are some which are more easily or more commonly employed than others. The following enumeration embraces the more usual and important varieties. Suffocation from division of the frænum linguæ and turning back of the tongue; stoppage of the aërial passages; asphyxia by strangulation or by deleterious gases, or by plunging into privies; torrefaction; drowning; wounds and bruises about the head or in different parts of the body; crushing of the head; punctures per rectum or in the region of the heart: to which may be added some of the causes mentioned under the criminal means of death during delivery. The criminal intention in many of these injuries would be self-evident. A recent case of infanticide in Guernsey was perpetrated by laceration of the frænum linguæ and puncture per rectum. (Edin. Med. and Surg. Journal, No. cvii. p. 548.) The proofs of murder were unquestionable.

The effects of injuries about the neck demand the strictest scrutiny; for strangulation is perhaps the most frequent of all causes of infanticide by commission. The fallacies by which it is beset are the "entortillement" of the umbilical cord; supposed injury from compression by the os uteri and vagina; or from the assistance which a woman might endeavour to render herself; possibility of post-mortem injury; and livor, or spontaneous sugillation.

The turning of the umbilical cord around the neck requires that the funis should be of a certain length; (See Scott's Case of Infanticide; Edinb. Med. and Surg. Journal, vol. xxvi. p. 75;) and the mark, if any remain, cannot be circular unless it have made a second turn. No abrasion or puckering of the skin ever takes place from this cause. (*Ploucquet*, Ueber die gewalt. Todesarten, 378.) M. Klein, (Dict. de Médecine, tom. xiii. p. 183,) who has made special observations on the subject, denies that any sugillation or even impression ever occurs from compression of the neck by the cord, by the os uteri, or vagina. He has seen many children who have died from the first of these causes; and in none did he observe any mark left about the neck. But in infanticide, as in homicide generally, criminal efforts to extinguish life are executed most frequently with characteristic violence, and accordingly injuries of the tracheal cartilages or of the deep-seated muscles of the vertebræ are sometimes found, or plain impressions of the fingers. A few years ago we had occasion to examine the body of a child which had been destroyed by strangulation with the fingers. The impressions were distinctly perceptible on each side of the trachea, and the mark of the fingers gradually increased in distinctness from the back of the neck forwards. The trachea was not injured, but on each side of it coagulated blood was found.

The assistance which a woman might have endeavoured to afford herself would be generally recognisable by the nature, situation, and direction of the marks. The case of Marguerite Granger, related by Foderé, (Op. cit. tom. iv. p. 502,) affords an excellent, perhaps an extreme illustration of the kind of injury which might be expected in such a case; and his report shows that, though such injuries may be numerous, they will be superficial.

Chaussier (Recueil de Mém. p. 470,) asserts that injuries have been inflicted on the dead body for the purpose of determining an accusation against an individual. If such wounds or bruises have not been inflicted for twenty-four hours after death, there is no difficulty in deciding that they were not received during life. The lips of wounds are pale, without swelling or retraction. There is no clot of blood adhering to the surface, nor, in the case of contusion, is coagulated blood found in the surrounding cellular texture: hence there is no tumour. The characteristics of blows inflicted during life are tumour from extravasation of blood and serum; or clots of blood in the subjacent cellular tissue without tumour, or "incorporation of the blood with the whole thickness of the true skin, rendering it black instead of white, and increasing its firmness and resistance."

"In respect to external contusions," says Dr. Christison, (Cases and Observations in Med. Jurisprudence. Edinb. Med. and Surg. Journal, No. xcix. p. 247,) "experiments show that for some hours after death, blows will cause appearances which in point of colour do not differ from the effects of blows inflicted recently before death; that the discoloration generally arises like lividity, from an effusion of the thinnest possible layer of the fluid part of the blood on the outer surface of the true skin, but also from an effusion of thin blood into a perceptible stratum of the true skin itself; and that dark fluid blood may be even effused into the subcutaneous cellular tissue in the seat of the discolorations, so as to blacken or redden the membranous partitions of the adipose cells, but that this last effusion is never extensive."

"It is impossible," continues Dr. Christison, "to fix absolutely the limit of the interval beyond which contusions cannot be imitated by violence applied to the dead body. It appears to vary with the state of the blood, and the time which elapses before the body cools and the joints stiffen. Sometimes the appearance of contusions can hardly be produced two hours after death; sometimes they may be slightly caused three hours and a quarter after it; but I should be inclined to think this period very near the extreme limit."

The testimony of Chaussier (Recueil de Mém. p. 471,) corresponds with what has just been stated. "If," says he, "the injuries have been inflicted soon after death, whilst the muscles preserve their contractility, there will neither be tumefaction, nor infiltration of blood into the cellular tissue, or the blood will only form a clot without adhesion to the divided surfaces."

Lividities or livor, which are the terms employed to express the nature of discolorations occurring spontaneously after death, may be easily distinguished from ecchymoses, which are the result of injury during life. Livor is generally found on the back and thighs, or on the parts of the body on which it has remained when becoming cold. Sometimes it extends more particularly to the head or neck or genital organs. Lividities assume varieties of appearance, but they are confined to the skin, and are greatest when the blood has long retained its fluidity. Infiltration or effusion of blood into the cellular tissue never occurs from them, nor are they ever attended by tumour.

Ecchymosis or sugillation, on the contrary, is characterized by a true effusion of blood, which has formed a coagulum, and this coagulum is intimately adherent to the meshes of the cellular tissue, and frequently forms a tumour. In the progress of putrefaction, indeed, the blood resumes its fluidity, escapes from the vessels, and collecting under the skin forms soft fluctuating tumours, which, on being opened, are found to contain a dark sero-sanguineous fluid. But it would be impossible for any person of moderate information to confound such appearances with the phenomena of true ecchymosis.

Death from torrefaction or burning is of rare occurrence in criminal cases, yet we are informed by Dr. Ryan, (Manual of Med. Jurisprudence, p. 169,) that an instance of this crime has been recently perpetrated in London. The circumstances to be investigated by the medical jurist would be, whether the child was killed by burning, or the body was thrown into the fire after death from other causes. Some late experiments of Professor Christison (Edin. Med. and Surg. Journ. No. cvii. p. 323,) show that "a line of redness near the burn not removable by pressure, and likewise the formation of blisters filled with serum, are certain signs of a burn inflicted during life." The application of a cauterizing iron ten minutes after death did not cause redness, although vesications were produced; which vesications, however, did not contain serum, but were dry and filled with air.

Instances of infanticide by drowning are infrequent. The proofs would be found in the signs of extra-uterine life, the absence of other efficient causes of death, and the presence of phenomena which are usually observed in asphyxia from submersion. (See Asphyxia.) We may observe that the presence in the bronchi of a portion of the fluid in which the body was found is no proof of death by submersion; for fluids will pass into the bifurcations of the bronchi if the body have been thrown into water after death. If, however, any of the fluid, and particularly any foreign matters contained in it, were found in the stomach, death from submersion would be unquestionable, as it could only have arrived there from deglutition. The indications of struggling which are sometimes met with in adults destroyed by drowning, could not be expected in a newly-born child under such circumstances.

Death from criminal injuries of the head are distinguishable by the fracture of one or more bones in situations which, neither in the course of natural parturition nor in the case of sudden expulsion, are liable to them. Ecchymoses and wounds almost always accompany them.

In injuries of the head from violent compression criminally applied, it is highly improbable that the marks could be confounded with those which sometimes, though very unfrequently, occur during labour. The unusual situation, severity, and complications of the injuries, with the indications of extra-uterine life, would, in the absence of the signs of difficult labour, dissipate all doubt as to their origin. We shall here detail the marks of difficult labour which are usually met with.

In a first labour, even when there is no unusual disproportion between the head of the child and pelvis of the mother, and the delivery has been accomplished with moderate celerity, we observe in the presenting part of the child a tumefaction of uncertain extent and size. On dissecting this tumefied part, a serous infiltration, sometimes with sanguineous engorgement, is found under the subcutaneous cellular texture, and which does not exist in other parts of the head.

In a woman who has borne several children, whose pelvis is large, and the os uteri soft and yielding, this impression is so slight as to be scarcely perceptible, especially if the child is small, and the delivery have been quick. On the contrary, when the head of the child is large, the bones firm, and the labour slow and painful, so that the head have been delayed in the pelvis, the tumour is large, prominent, and unyielding. When cut into, we not only find a sero-sanguineous effusion into the subcutaneous cellular tissue, but the pericranium is detached and elevated by a collection of dark fluid blood, the bone is brownish, and the connecting membranes are more or less elongated. These changes are still greater when the superior aperture of the pelvis is narrowed by an unusual projection of the promontory of the sacrum. Then the head is deformed, elongated in its greater diameter, flattened in the transversal. Sometimes even a depression or fracture, longitudinal, angular, or starred, of one or both parietal bones, may occur. All these phenomena are distinguishable from those produced by accidental or criminal violence, by the nature and position of the tumour, and of the other injuries which result from the unnatural projections of the pelvis. Such deformity of the pelvis is ascertainable at any period after delivery; and where the usual proportions between the head of the child and pelvis of the mother exist, the appearances above adverted to are never met with.

We here terminate all the remarks we have to offer on the causes of the death of a newly-born child,* and venture to state that the indications afforded by them will be found applicable to the solution of the difficulties which can be reasonably anticipated on trials for infanticide. Undoubtedly instances may occur in which it will not be possible to demonstrate the causes of death, but such is the case also in other varieties of homicide. In infanticide the victim is incapable of resistance, and hence some of the ordinary proofs of homicide may be absent; but the kind and degree of injury necessary for the destruction of the life of a child are very rarely nicely measured by the perpetrator of the crime; and the violence committed is most frequently such as to leave no doubt as to the cause of death, and to constitute, at the same time, the most indubitable evidence of extra-uterine life. It is unquestionable, however, that medical evidence on trials for infanticide has not influenced the decisions of juries in the same degree as on trials for other kinds of murder. By some this has been attributed to the doubtful and hesitating manner in which medical witnesses have generally delivered their testimony, (Edin. Med. and Surg. Journal, vol. xxvi.); by others, to the impression that the killing of a new-born child, when perpetrated under the impulse of injured honour and fear of disgrace, should not be classed with the other varieties of murder. The latter question we shall not attempt to discuss; but as regards the former explanation, we unhesitatingly express our conviction that the anatomical, physiological, and pathological phenomena on which medical evidence is founded on these occasions are as susceptible of positive conclusion as any other facts within the sphere of medical investigation. Nevertheless, we are not surprised that medical men should frequently be unprepared to deliver their testimony with clearness and decision in criminal trials. The facts and information connected with these subjects are rarely applicable in the discharge of the ordinary duties of medical practice, and general practitioners in active occupation have, therefore, no great inducement, and seldom sufficient leisure to devote to the literary and experimental researches which investigations in medical jurisprudence demand, whilst it is to this class of practitioners that reference is generally made in medico-legal proceedings. The custom which prevails in Germany and other northern countries of Europe of appointing a medical officer for each district, whose especial duty it is to investigate all cases which become the subject of juridical proceeding, seems worthy of imitation in this kingdom. The establishment of such an office creates individual responsibility, and ensures a due preparation for the faithful discharge of it; and the concentrated experience thus acquired has contributed to the exactness and extension of medico-legal knowledge. Under existing arrangements in this country, the infrequency with which individual practitioners are called on to act, constitutes perhaps the chief reason why this department of professional study has hitherto been comparatively neglected.

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* For the signs of death by poisoning and deleterious gases, see Toxicology.

III. We next proceed to inquire into the proofs whether the suspected mother has been recently delivered.

As collateral evidence, it is advisable to ascertain whether the general symptoms of pregnancy have pre-existed. It is evident that no conclusive opinion can be formed in such a case, auscultation and the *ballottement* supplying the only positive evidence of pregnancy. But if the menses have been suddenly suppressed, the mammæ and abdomen have enlarged, and no other symptoms of disease than inappetency, irritability of the stomach, and dyspepsia have followed, it may be reasonably presumed that the woman has been pregnant.

The proofs of recent delivery are furnished by an aggregate collection of signs, which, separately considered, do not admit of positive inference. In a woman recently delivered, particularly of a first child, the following appearances are very generally met with: the face is rather pale, the eyes are sunken and surrounded with a dark circle; the pulse is rather quick, full, and undulating; the skin soft, with some heat and moisture, having a peculiar acid odour. The breasts are tumefied, distended, and painful, yielding on pressure or suction a fluid having the characteristic properties of milk; the belly is soft, and the skin is wrinkled and marked with short red or white lines passing in different directions, chiefly towards the umbilicus; a separation of the linea alba is perceptible, particularly towards the umbilicus. The uterus is felt above the pubis. There is a discharge from the vagina either of a red, greenish, or light colour, and of peculiar odour. The genital organs are more or less tumefied, and considerably dilated in their whole extent; the fourchette is lacerated; the os uteri is soft and relaxed, so as easily to admit of the introduction of the fingers, and a discharge similar to what has been just mentioned flows from it.

There is no known disease which will produce the concurrence of signs now enumerated, whilst after parturition, and particularly after a first labour, they almost uniformly occur.*

But the discovery of such a series of symptoms will depend altogether upon the period of time at which the examination was made. Zacchæus long since observed that the proofs of delivery were uncertain after the tenth day. (Quæstiones Med. Legal. ii. lib. 7, quæst. 2.) After the fourth or fifth they become less distinct, gradually diminishing, and at the end of a fortnight are indecisive. The possible fallacies are the sudden cessation of dropsies; the expulsion of hydatids or moles. The Foreign Quarterly Journal of Medicine and Surgery contains a case of the sudden disappearance of dropsy, in which the water was discharged per vaginum by passing down the fallopian tubes. In Rust's Magazine (Vol. 21) a case is related of the discharge of a "mole" preceded by the general symptoms of pregnancy, and accompanied by flooding and other signs of parturition. The discharge of the menstruous fluid after long retention might simulate some of the symptoms of recent delivery, but many of them and those the most decisive, would be absent in all such cases; whereas, after delivery, and particularly of a first child, almost all would be found to concur.

IV. Do the phenomena presented by the supposed mother and child establish the suspected relationship?

The solution of this question is almost always easily determined in cases of infanticide by moral evidence; and indeed it is by moral evidence alone that it can be positively settled. Medical testimony must be confined to showing that there is an agreement of the phenomena presented by the child with the indications of delivery observable in the woman. The data thus derived can be of a general nature only, and are confined chiefly to a comparison of the state of conservation or decomposition in which the body of the child was found, with the presumed period of delivery.

If the inquiry were not instituted for some days after delivery, it would be necessary to take into consideration the circumstances capable of accelerating or retarding decomposition. For instance, putrefaction proceeds most rapidly when the atmosphere is humid and still, and the heat ranges between 60° and 80° Fahr. It proceeds most rapidly in parts of the body which have sustained injury either before or after death.

It is important to remark that in bodies plunged into privies, putrefaction does not commence so soon as when they are exposed to the air; but having begun, it proceeds more rapidly in such a situation. Decomposition is retarded by submersion in water, so that two or three weeks generally elapse before, in bodies so circumstanced, putrefaction commences.

Some remarks on post-mortem examination, and on the drawing up of medico-legal reports with reference to the present subject, would furnish practical information of value, and hence form an useful appendix to this essay. It already, however, occupies the limits which can be assigned to it in the Cyclopædia, and we content ourselves with referring the reader to the Thesis of Lecieux, where the points now adverted to will be found admirably exemplified.

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* A curious application of the knowledge of the signs of recent delivery has been meutioned by Capuron, Méd. Légale, p. iii. A young woman simulated pregnancy, and pretended to have been delivered, in order to obtain from her lover the execution of a promise of marriage. The latter claimed the child, which could not, of course, be produced. A charge of infanticide was brought against the pretended mother, who was compelled to show that she had not been delivered. This was attested by the medical examiners.

ROBERT ARROWSMITH.

INFECTION, *infectio*, (not classical,) *infectus*, and *inficere*, Lat.—The meaning of this word has been, and perhaps still is, unsettled. It will be employed in this article to signify the deleterious or offensive qualities which certain matters designated by the terms malaria, matter of contagion, emanations, and effluvia, communicate to the air and other inert bodies; and likewise the pernicious effects which some of these substances produce on the human constitution. This description comprises, if we mistake not, all the physical senses in which the word is usually employed. It will be observed that, according to one of them, it is to a certain extent synonymous with contagion, and it is likewise made so by the custom of the majority of the profession; a custom which is in a great measure owing, we believe, to the word *contagion* being destitute of the verbal form, whence the phrases *to infect* or *to be infected* become convenient modes of expression. A good deal of confusion has resulted from an attempt to discriminate between contagion and infection, when the latter term is employed to express the transmission of disease from man to man; and in the article CONTAGION we have expressed an opinion that in this case the words should be regarded as strictly synonymous; but it will be observed that infection possesses a wider sense than contagion, being applied to cases of contamination which are never designated by the latter word.

Deleterious qualities may be communicated to certain bodies either by matters known only by their effects on the human constitution, or by those which affect perceptibly the sense of smell. Of the former an account will be found in the article CONTAGION, and in those on MALARIA and MIASMA. The latter consists of hydrogen and its compound gases, carbonic acid, azote, and perhaps other gaseous matters which are the result of animal and vegetable putrefaction aided by the presence of moisture. Their sources are various, such as cemeteries in which bodies are deposited at an insufficient depth from the surface, or from which it has been found necessary to remove the accumulated remains; slaughter-houses; dissecting-rooms; neglected privies and drains; stagnant waters, in which organic recrements are undergoing decomposition, as is often exemplified in noisome swamps, or at low water on the banks of rivers near their mouths, when in the vicinity of populous towns; human beings accumulated into a small space with deficient ventilation, &c.

The two genera of infecting substances frequently co-operate in producing an effect on the human system. Thus it is commonly observed that contagious diseases are more generally diffused and assume a worse character in an atmosphere abounding in manifest impurities than in one which is free from them. During the prevalence of typhus at Paris in 1814, the mortality was observed by M. Jadioux to be frightful in those wards of the Salpêtrière which are situated near the sewer of the hospital; and it were very easy indeed to multiply examples of this description.

The bodies which are sensibly contaminated by infecting particles are various, and differ much in their power of receiving and retaining the contamination. Confined masses of atmospheric air receive it readily and retain it long, as likewise do solid bodies which possess the property of holding air in a quiescent state within their interstices, such as cotton, wool, cloths fabricated from these substances, fur, feathers, &c. On the contrary, smooth and polished surfaces are tainted with difficulty, and are readily cleared of the pollution. These facts are illustrated by the well-known experiment of Mead, who placed a portion of carded cotton near a morsel of putrefying meat under an inverted bell-glass, and thus ascertained that the downy substance became strongly impregnated with the odour, and retained it long, whilst the contrary was the case with the smooth surface of the glass. The same rule is observable with respect to certain infecting particles of which our senses are unconscious, for the downy substances named retain contagious matter long, and hence become powerful fomites; but there is no reason to think that the species of marsh effluvia called malaria adheres to them so as to render them the media by which it is communicated to the human system.

Action of Infecting Substances on the Animal Economy.—We now come to the second branch of our subject, the consideration of the mode in which infecting agents operate on the human constitution, and the kind of change which they produce there.

If common odorous infecting matters are freely diluted with atmospheric air, we find that persons do not suffer from exposure to them, as is exemplified in the case of butchers, tanners, &c.; but in a more concentrated state they produce very deleterious effects, and occasionally instant asphyxia, which was illustrated by the well-known case of the exhumations in the cemetery of the Innocents at Paris, and is not unfrequently exemplified in attempts to empty privies which have been long neglected. The slower but yet pernicious effect of the same cause is shown in the unhealthy aspect of the inhabitants of filthy and ill-ventilated alleys in large cities of which the police is neglected. Those agents whose existence is recognised only by their influence on the animal economy are likewise found to be affected by admixture with pure air. The effect of dilution is very conspicuous in the case of human effluvia, which have their intensity much diminished in a free and pure atmosphere. Marshy emanations retain considerable noxious power at a distance from their source, but there is a point beyond which they are inoperative, showing that diffusion in the atmosphere is ultimately destructive of their agency.

There are two hypotheses regarding the mode in which these matters act injuriously on the economy. According to one, their operation is on the nerves of the part to which they are applied; the other supposes them to be absorbed from the same part into the circulation. In the present state of our knowledge, it is impossible to decide in favour of one or the other of these modes, or to say that either of them is that which is uniformly operative. The very rapid action of certain mephitic gases leads to the supposition that an impression on the nerves of the air-passages is sufficient for the production of *their* poisonous effect on the system. The cutaneous surface, the mucous membrane of the air-passages, and the corresponding surface of the alimentary canal, have each of them been supposed by different medical reasoners to be the channel by which noxious agents find access to our system. Lancisi, who first reasoned with any degree of accuracy on this subject, conceived that such agents might be transmitted by all these media to the interior; and we believe that he was correct in supposing that any of them might be the channel through which the system is contaminated. When the epidermis is entire, the absorbing power of the cutaneous surface is so very feeble, and its nerves are so protected by an inert covering that it is probable that gaseous matters of a noxious nature rarely act in this way; but more concentrated substances often do so when the surface is broken, as in inoculation or injuries from dissection, which last certainly produce a species of infection. The first impression from infecting matter diffused in the atmosphere was supposed by the late Dr. Jackson to be made on the alimentary canal; and it is very probable, at least, that by the act of deglutition, which persons are almost incessantly performing to swallow their saliva, noxious particles may be conveyed thither, and whether we regard its mucous membrane as an absorbing or sentient surface, it is one through which such particles are very likely to act on the animal economy. But the most ready access for atmospheric poisons to the system is afforded by the air-passages. The experiments of Nysten and Edwards have proved that hydrogen, azote, and other gases, are rapidly absorbed by the lungs; and analogy would lead us to attribute a similar susceptibility of absorption to contagious and other miasmata; whilst if we reject the necessity of absorption, and assume that a nervous impression is all that is required, we find a widely extended and sensible membrane on which the deleterious corpuscles may operate.

The local operation of these poisons has been considered as far as our present knowledge of the subject admits. It remains that we should notice their more general effect, or their operation on the animal economy, if we are to take such a view after they are absorbed into the circulating mass. To discuss the various changes which odorous infecting matters effect in the system—the modes in which they destroy life or impair its vigour, would lead to a very lengthened disquisition, and one which perhaps belongs rather to the physiologist than the practical physician. But the agency of the morbific poisons by which what is strictly called infection of the human constitution is produced, and diseases are engendered ranking among the most important of our nosologies, demands some notice in this place. To whatever parts of the body morbific animal poisons or marshy effluvia may be in the first instance applied, and however various the diseases ultimately engendered by them, we believe that their primary constitutional effect is on the nervous system. The period which generally intervenes between the application of a contagious or paludal poison and the full development of the disease engendered by it, is not one of health; and the slight signs of indisposition which exist are referable to the nervous system solely, excepting in a proportion of the cases arising from marsh effluvia, where some disorder of the bowels is after a time associated with the indications of nervous affection. These indications are extreme debility, inertness in motion, irritability and despondency of mind, incapacity of continued attention, noises in the ears, occasional giddiness, inappetency or morbid appetite, and extreme susceptibility of the impression of cold, the vascular system being during this period free from manifest disturbance. The first symptoms of the invasion of the actual disease partake of the same nervous character. They are giddiness of the head, pain there and along the spine, marks of irregular distribution of heat, rigors, inappetency, nausea, and in a proportion of the cases of some diseases, the exanthemata for instance, convulsions. One morbific poison, that of hydrophobia, appears to confine its whole operation to the nervous tissue, an extraordinarily erethismal state of this tissue giving rise to all the phenomena of the disease, and at its fatal close there being no traces of local affection of uniform occurrence or of such importance as to be considered as the source of the symptoms witnessed during life. In most diseases the vascular and other systems are ultimately involved, but accurate observation will always discover preceding indications of an affection of the sentient portion of the frame.

For the mode of purifying infected substances, see DISINFECTION.

JOSEPH BROWN.

INFLAMMATION, from *inflammo*, to burn; hence, also, *phlogosis*, *phlegmasie*, *phlegmon*, &c. from φλέγω: a name given on account of the resemblance of spontaneous inflammation to the effects of the application of fire to the living body.

There has hitherto existed so much diversity of opinion respecting the proximate cause or nature of inflammation, and it is a disease assuming such an infinite variety of forms, that it is scarcely possible to give a strictly correct and scientific definition of it. The following, proposed by Peter Frank, is the most comprehensive and accurate which has hitherto appeared:—"Calor partis, tensio, moles, ac durities acuta; ut plurimum cum sensu doloris fixi, nunc ardentis, nunc pungentis, pulsantis, nunc gravativi, aliquando nullæ, cum colore vivido, nunc profundius rubro; sæpissime cum febre, pulsu frequenter pleno, forti ac duro, sæpe contracto ac parvo, aliquando naturali; ac tumoris evidenti, aut in suppurationem, aut in gangrenam nisu, dicitur inflammatio." P. Frank, however, judiciously adds that the presence of all these signs is not necessary to constitute inflammation, and that frequently some of them are wanting.

So large a proportion of the diseases which affect the human frame are of an inflammatory nature, that the study of the pathology and treatment of inflammation has at all times been considered a subject of interest and importance. The opinions entertained by professional men at different periods on this branch of medical science have necessarily varied with the prevalent theories of the day. The writings of the older authors abound with speculations, more or less ingenious, respecting the nature, causes, and treatment of inflammatory affections; and although they do not supply much information founded on the sober and rigid deductions of experimental philosophy, a brief review of the theories of inflammation may prove both interesting and useful, as an occasional ray of light sometimes glimmers forth in the midst of much obscurity, and the errors into which those who have indulged in visionary conjectures have fallen, may serve as beacons to protect us from a similar danger.

The general principles respecting the nature of diseases, promulgated by Hippocrates, exercised a considerable sway over medical science for above two thousand years, holding a more or less prominent station in the systems of almost every sect down to the close of the last century. These views laid the foundation of the Humoral Pathology, in which the first material innovation, and especially in the theory of inflammation, was made by Paracelsus in the fifteenth century, who, having bestowed considerable attention on the study of chemistry, endeavoured to account for all diseases by changes in the chemical composition of the animal fluids. This gave origin to the sect of *chemical physicians*, who violently opposed the doctrines of the school of Hippocrates and Galen. There was a strong tendency in the physiologists of that period to ascribe exclusively the phenomena of life to the influence of the same laws as those which regulate the motions of inanimate matter; and some conceiving they could satisfactorily explain all the operations of the animal economy on the principles of mechanics, founded a sect of *mechanical* physicians.

The ignorance which had hitherto prevailed respecting the circulation of the blood contributed, no doubt, very materially to prevent the introduction of more correct views of pathology: it was very generally believed that the liver was the centre of the vascular system, from which the blood went forth by day to the extremities, returning again by night; if any peccant matter irritated the liver, the blood was sent out more forcibly; and if, at the same time, any part of the body were either weakened or irritated, a swelling was produced by the flow of humours to this place: fluxions might therefore happen either from weakness or irritation; the peculiar nature of the swelling was supposed to be modified also by the nature of the humour: blood produced the true phlegmon, bile being the supposed cause of erysipelas, &c. The blood and humours were imagined sometimes to stagnate in a part from want of expulsive power, and this was termed congestion; whilst fluxion or defluxion denoted a sudden flow of humours from a distant part.

The discovery of the circulation of the blood by Harvey in the beginning of the sixteenth century, was not followed by such an immediate improvement in the theory of inflammation or of other diseases as might perhaps have been expected. Although the course of the blood in the large vessels, and the connection between the lymphatic and sanguiferous systems through the medium of the receptaculum chyli and thoracic duct, were facts clearly ascertained, the functions of the capillary circulation and of the nervous system, which are more immediately connected with the proximate causes of inflammatory affections, were yet very little understood.

Bōerhaave, one of Stahl's contemporaries, a professed eclectic, endeavoured to select whatever appeared most valuable in all preceding systems, and to combine the whole into a uniform body of medical science. He took the humoral pathology as the basis of his theory of disease, and especially of inflammation, but adopted also many of the opinions of the chemical and mechanical sects. He considered that the blood and humours were vitiated in disease either by an excess of acid or of alkali, or by becoming too viscid and glutinous, or too thin and watery; that the circulation of the fluids might be too rapid or too slow; that the fibres of the solids were either too feeble and relaxed, or too rigid and elastic; that there were also separate diseases of the large vessels and of the capillary system.

The following summary will afford a connected view of the fanciful speculations of the different sects whose opinions we have thus briefly noticed. The propelling force of the heart having been ascertained, and microscopic observations having been made on the capillary vessels, and on the size of the globules which pass through them, the mechanical physicians imagined they could satisfactorily explain many of the phenomena of disease by the effects of friction, pressure, and trituration, and by the relative dimensions of the vessels and of the globules which they circulate: these globules were described by Leeurvenhack as conical; so that, when forced into very small vessels, they became fixed like a wedge. The combinations and decompositions of the chemists added to the preceding theory that of the acrid and inflamed, the inspissated, fermented, or putrid state of the humours. They were thus heated by the excess of friction, of motion, or of pressure, or rendered acrid, irritating, and inflammatory by an excess of acid; they distended the vessels by their rarefaction, were condensed by evaporation, becoming then corrupt and dissolved; or when too viscid and inspissated, they stagnated in the vessels, which were too feeble to expel them, and became cold and concrete, until some strong reaction took place by which the crude morbid humour was concocted, and the tumefaction resolved either by the formation of pus or the elimination of the concocted humour through some of the excretory organs. At other times, the solids being too lax and weak for the perfect elaboration of the fluids of nutrition, became corrupted and dissolved, acquired an excess of alkali, and gave origin to putrid diseases. Their treatment was adapted to these views of the nature and causes of diseases, and we consequently find in their therapeutics refrigerant remedies, delayants, inspissants, antiseptics, resolvents, depuratives: and some slight share of influence in the production of disease being allowed to the solids, there were also remedies intended to increase the tone and cohesion of the fibres; others to relax and lessen rigidity, and others to allay excessive sensibility.*

The contending sects of chemical and mechanical pathologists were completely overthrown in the beginning of the seventeenth century by the opinions of the celebrated Stahl. Having noticed that the changes which the components of the body undergo during life, differ greatly from those that take place after death, he conceived, like Hippocrates, that there must necessarily exist some additional principle during life, by which the action of the mere physical laws is counteracted and modified, and from which the body thus derives its distinctive character of vitality. He imagined this agent, which he called *anima*, to be something distinct from the body, possessing a species of intelligence which enabled it to act the part of a rational being, and to superintend all the operations of the animal economy. There is an apparent analogy between the *anima* of Stahl, and the φύσις of Hippocrates: the latter, however, only proposes his term as a rational manner of explaining the facts he observed, whilst the former considers his principle as an abstract metaphysical spirit, capable of acting independently of the state of the body, and without any physical necessity arising from that state. In other respects Stahl adopted most of the opinions of Hippocrates, and engrafting on them some of the doctrines of the chemical school, his pathology turned chiefly upon the opposite states of plethora and cacochymy.

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* For a full account of all the leading medical theories, see Broussais' Histoire des Doctrines Médicales.

Van Helmont, one of the most distinguished of the Vitalists, proposed a more rational theory of inflammation than any of his predecessors. According to him there were two circumstances indispensable to the development of inflammation—the action of a stimulus on parts endowed with sensibility, and an increased activity of the arterial system, followed by redness, pain, heat, and swelling in the part thus stimulated. He not inaptly compared the action of the stimulus to that of a thorn thrust into living flesh: this excited the alarm of his *archæus*, who immediately caused an increased flow of blood to the part, and set up a defensive and reparatory process. He adopted also many of the chemical opinions, conceiving his ideal inflammatory thorn to be generally acid, &c.

The humoral pathology, after keeping for a long period almost exclusive possession of the medical schools, began to receive a serious check from the doctrines taught at the University of Halle by Hoffmann; who contended strongly against the long-established notion that a vitiated state of the fluids was the primary cause of the great majority of diseases, and maintained that it was much more rational to attribute their various phenomena to morbid conditions of the solids, by which the fluids themselves were contained, elaborated and kept in constant motion. There were, according to him, two principal morbid states of the solids, *spasm* and *atony;* and as the motions of the solids seemed to depend in a great measure on the influence of the nerves, he ultimately referred most diseases to affections of the nervous system: he attributed to the nervous principle the functions which Stahl ascribed to his *anima*, and Hippocrates to his φύσις. These views of disease were zealously embraced by Baglivi in Italy, Barthez at Montpellier, and Cullen in our own country: the latter applying them with great talent and ingenuity, as will be seen presently, to the theory of inflammation. The humoral pathology soon became completely exploded, and a totally opposite system was substituted in its place, called that of the *Solidists*. The introduction of this system was greatly favoured by the labours of the celebrated Haller, whose important discoveries in anatomy and physiology have contributed so much to our knowledge of the intimate structure and functions of the different organs, and particularly of the nervous system.

Dr. John Brown of Edinburgh, adopting some of the opinions of the Solidists, founded on them a most fanciful system of physiology and pathology, which, although less noticed in this country, was eagerly adopted in France and Italy, and partially also in Germany, and had a most baneful effect over the practice of medicine in these countries. According to Dr. Brown, life is only sustained by the action of either external or internal stimuli on the body through the medium of the nervous system: this susceptibility of impression he calls *excitability*. If the action of stimulants be too much increased, this gives rise to diseases with excess of action (*sthenic*), and, when deficient, to diseases of debility (*asthenic*.) Asthenia is subdivided into *indirect*, when the excitability is exhausted by excessive excitement, and into *direct* when the deficiency of excitability arises from a want of adequate stimulus. Dr. Brown attended more to the state of the general excitability than to the condition of the organs: there were thus two deviations of the excitability from the standard of health, constituting the *sthenic* and *asthenic* diatheses, and only two great classes of diseases: he maintained, moreover, that both sthenia and asthenia could never exist together in the same individual; so that, if an individual presenting signs of general debility was seized with pneumonia or hepatitis, the local affection, however severe, was attributed to debility, and treated by stimulants: inflammations were thus divided into two classes, the sthenic and asthenic; and idiopathic fevers, hemorrhages, congestions, convulsions, plethora, &c. were classed among the diseases of debility. He asserted that the diseases of direct and indirect debility so greatly preponderate over those of the opposite class, that out of every hundred cases there were scarcely three of genuine inflammation: there were accordingly only two classes of remedies, and these pernicious principles necessarily led to a most incendiary system of practice. The apparent simplicity and plausibility of this theory unfortunately obtained for it numerous adherents.

The Italians, after adopting Brown's theory, discovered at last its fundamental errors, and engrafted on some of his physiological principles a new system called the *contro-stimulant;* they admit two opposite diatheses, one of *stimulus* and one of *counter-stimulus*, and have founded a third class of diseases consisting of local irritations, which may give rise to either of the two preceding morbid states of the constitution: they accordingly adopt only two classes of remedies, the stimulants and counter-stimulants; the latter being supposed to remove directly, and without even any evacuation, the excess of stimulus in the system, whilst stimulants act in a manner directly the reverse: the animal fibre, it is also supposed, will tolerate the action of stimulants or counter-stimulants exactly in proportion to the strength of the existing diathesis, either of stimulus or counter-stimulus. Venesection is, however, considered as an active counter-stimulant. Counter-stimulant remedies include above nine-tenths of the Materia Medica; we have thus tartar-emetic, bark, mercurial and saline purgatives, preparations of iron, all kinds of bitters, &c. classed together as suited to combat inflammation. The really stimulating remedies are limited to a very small number, such as opium, fermented liquors, &c.

Several distinguished physicians introduced about this period the more practical and judicious method of investigating carefully the symptoms, course, varieties, and post-mortem appearances of diseases. A number of highly valuable monographs of disease were the result of this course of proceeding. Among these we must first mention, as particularly deserving of notice, the works of the great Sydenham. He was the foremost to perceive the necessity of descending from the engaging but profitless regions of fanciful speculation, to the more laborious task of a rigid and accurate observation of the phenomena of nature; and his example had a powerful influence in giving a new and better direction to the investigations of medical science throughout Europe. Many excellent descriptions of the inflammatory affections of separate organs, and of the alterations of structure which they induce, are also to be found dispersed throughout the writings of Grant, Stoll, De Haen, Morgagni, Bonetus, Wagler, Rœderer, &c. Bordeu, in his work on chronic diseases, gives a very minute and faithful account of the irritative and inflammatory affections of the digestive tube, and lays considerable stress on the sympathetic influence exercised by the abdominal viscera over every other part of the animal economy.

Inflammatory diseases had not, however, hitherto formed the subject of any special and separate inquiry; and the merit of having contributed the first scientific work on this important class of diseases belongs to our talented countryman Dr. Carmichael Smith, who in 1788 published an admirable paper on this subject, (Medical Commentaries, vol. ii.,) in which he took a comprehensive view of the peculiarities of inflammation as they are observed in the principal elementary tissues that enter into the composition of the body: this was laying the foundation of the morbid anatomy of tissues, from the cultivation of which medical science has since derived such incalculable advantage.

The next separate treatise on inflammatory diseases was one on chronic inflammations by M. Pujol, of Castres in Languedoc, which obtained a premium from the Royal Academy of Medicine of Paris in 1791: in this valuable work the author first considers the chronic inflammatory affections of the surface of the body, and next those in succession of the three splanchnic cavities.

The preceding writers had confined themselves to a general description of the different varieties presented by inflammatory diseases, and of the changes of structure they induce. The celebrated John Hunter instituted an experimental inquiry into the essential nature and proximate cause of the process of inflammation, an undertaking for which he was particularly well qualified by his admirable knowledge of the minute anatomy of tissues; and his great work on the *blood, inflammation, and gun-shot wounds*, appeared in 1794: this was the first experimental and scientific treatise on the theory of inflammation ever published;* it is distinguished for depth and accuracy of observation, acuteness of reasoning, and original and enlarged views of the laws which regulate the functions of life, and must ever be considered as a lasting monument of the author's genius. We shall frequently have occasion to refer to it in the course of this article.

The modifications occasioned in disease by the structure of the part affected, were beginning to excite more general attention, as appears by the writings of Dr. Wm. Hunter, John Hunter, the two Monros, and Dr. Cullen, as well as by the splendid collections of pathological preparations made by the four former. M. Pinel, sensible of the many advantages that might be derived from a more comprehensive study of the influence of texture in modifying disease, made this the ground-work of his valuable *Nosographie Philosophique*, which was first published in 1797. Although some imperfections must necessarily attach to every nosological arrangement in the present state of medical science, the plan followed by this distinguished pathologist was infinitely superior to that of any of his predecessors, and had a highly favourable influence on the medical opinions of the time. The phlegmasiæ constitute the second class of the Nosographie Philosophique, and are divided into five orders, founded on the five principal animal tissues—inflammations of the cutaneous tissue; of mucous membranes; of serous membranes; of the cellular tissue and parenchymatous texture of organs; of the muscular, fibrous, and synovial tissues: this is exactly the division that had been adopted several years before by Dr. Carmichael Smith.

It was the Nosographie Philosophique that suggested to Bichât the plan of his great work on the anatomy of tissues. This justly celebrated work may be considered as having laid the foundation of the improvements made in France in every department of anatomical and physiological science, since the beginning of the present century: it is only necessary to refer in proof of this to the labours of Laennec, Bayle, Magendie, Broussais, Andral, Louis, Lallemand, Rostan, &c.; and as relating more exclusively to the subject of the present paper, to the *Histoire Anatomique des Inflammations* of M. Gendrin, by far the most comprehensive and practical work that has yet appeared on inflammation; and to another valuable work, entitled *Recherches Experimentales sur l'Inflammation*, by M. G. Kaltenbrunner, published in the *Répertoire Général d'Anatomie et de Physiologie Pathologique.*

[On all this subject, most valuable information is contained in Dr. Alison's *Outlines of Pathology and Practice of Medicine*, Amer. edit. Philad. 1844; Dr. Williams's *Principles of Medicine*,

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* A small treatise was published at Florence by Dr. Vacca in 1765, entitled *Liber Inflammationis morbosæ quæ in humano corpore fit, natura, causis, effectibus, et curatione*; but although containing some excellent observations, the work was chiefly speculative.

Amer. edit. Philad. 1844, and Mr. T. Wharton Jones's *Report on the Present State of Knowledge of the Nature of Inflammation*, in *Brit. and For. Med. Rev.*, April, 1844, p. 567.]

The cultivation of physiology and pathology has, during the same period, been pursued with great success in our own country. Among the many contributions to general or special pathology, may be mentioned those of Baillie, Thomson, Hunter, Philip, Hastings, M. Hall, Abernethy, Astley Cooper, Lawrence, Travers, Parry, Cheyne, Bright, James, Elliotson, &c.

Before concluding this brief historical sketch, we must notice the views respecting febrile and inflammatory diseases promulgated a few years since by Broussais, and very generally adopted in France. Although carried beyond their just and reasonable limits, Broussais' opinions have been the means of introducing a highly beneficial change in the system of practice of that country, by exploding Dr. Brown's phlogistic method of treating diseases, which was previously in almost general use.

Whilst Brown committed the great error of referring most diseases to a morbid state of the general excitability, overlooking in a great measure the constitutional effects of local diseases, Broussais, influenced probably by his more extensive acquaintance with pathological anatomy, founded his system of *Physiological Medicine* on the principle that all diseases affecting the general health have a local origin. Instead, also, of considering a morbid condition of the nervous system to be the proximate cause of all diseases, and the great majority of them as the effect of debility, he maintains that they depend much more generally on affections of the vascular system; that they originate in various degrees of irritation, congestion, and inflammation in some one organ, disturbing by morbid sympathy the functions of all the others; and that the great majority of diseases are, in fact, of an inflammatory nature. Local irritations and morbid sympathies constitute thus the fundamental principles of Broussais' system; many debilitating agents, he conceives, excite inflammation, and the deficient action of one organ may excite a sympathetic irritation in others. To the affections of the mucous membrane of the alimentary canal he attributes an inordinate degree of importance, more particularly the sympathy of the digestive with the other vital organs. He asserts that fever is always the effect of an irritation of the heart, either primitive or sympathetic; that every form both of continued and intermittent fever has for its primary cause inflammation of the mucous membrane of the stomach and bowels, which he terms *gastro-enterite*; he completely repudiates the notion of there being any such diseases as idiopathic or essential fevers, maintaining that they are all to be explained exactly on the same principles as the symptomatic fever of pneumonia: all the exanthemata, hepatitis, pyrosis, and a vast number of other diseases, are, according to him, complicated with gastro-enterite; and we heard him even boldly assert in his lectures, that hydrophobia was only a gastro-enterite, frequently complicated with some degree of inflammation in the pharynx and brain!—a most remarkable instance of the dangerous extent to which the distortion of facts may be carried by an immoderate love of theory. An exposition of the fallacy of Broussais' opinions respecting fever will be found in the introduction to the article FEVER.

In writing upon a branch of pathology which has been the subject of so much investigation as inflammation, we cannot avoid repeating a great deal that has often been previously stated by others: as a reference to authorities on all points respecting which there can be no difference of opinion would be endless and inconvenient, we think it preferable to state here generally, that the sources from which we have chiefly derived assistance in the composition of this article, are the works of John Hunter, Thomson, Travers, Craigie, Elliotson, Andral, Gendrin, and Kaltenbrunner. Whenever we have occasion to mention opinions which possess any degree of novelty or originality, we shall either quote the author or refer to his work.

Physiological and Pathological Considerations on the Circulation.—There are three of the elementary parts of the body that appear to be primarily and more essentially affected in inflammation: these are the blood-vessels, the nerves, and the blood. As every rational theory of disease must be founded on a correct view of the healthy phenomena of life, we shall offer a few observations on the action of each of these parts in the living body, before proceeding to the details of the theory of inflammation.

The minute ramifications of the arteries and veins, and the capillary system of vessels, being the principal seat of the morbid phenomena of inflammation, it is important, therefore, to attend to the peculiarities of the circulation in these vessels. It is now generally admitted that the arterial branches acquire a greater power of contractility in proportion as they become smaller, and that the arterial trunks are less contractile and more elastic. That the minute ramifications of arteries are endowed with a high degree of contractility, in virtue of which they are enabled to carry on the circulation independent of the action of the heart, is proved by a variety of circumstances. It is by this order of vessels that the functions of nutrition and secretion are performed, and it is absolutely necessary for the uniform and uninterrupted accomplishment of these varied and highly important functions, that they should have the power of controlling the motions of the fluid circulating within them. The relative momentum of the blood in different parts of the body, or the quantity of the blood and its velocity, are perpetually varying from the influence of external stimuli or internal causes; and this variable state of the momentum of different portions of the arterial system is a decisive proof of the vital contractility of its vessels. We thus observe the minute vessels of the cheek, in the act of blushing, acquiring increased activity and admitting more blood; while under the influence of depressing passions, such as fear, they are suddenly emptied, and the countenance becomes pale. Local inflammation is stated by all pathological writers to be characterized by a rapid throbbing pulsation of the vessels in the part affected, while the action of the heart and arteries of other parts of the body is not increased. If a person having inflammation in one hand be blooded in both arms at the same time, twice or thrice as much blood will flow from the diseased side as from the other. It is partly by the contractility of the extreme vessels in animals which have no heart, that the fluids in the lymphatics and lacteals are absorbed and moved. The minute arteries, like muscular tissues, retain the power of contracting after breathing has ceased; this is the cause of the empty state of the arterial system after death; for the small arteries and capillaries continuing to contract, empty their blood into the veins, while they receive no fresh blood from the heart. When death is rapidly occasioned by lightning or any violent narcotic poison, the action of the arterial and whole muscular system being suddenly destroyed, the arteries are found filled with blood as well as the veins.

The preceding facts respecting the active and independent power of the small arteries and capillaries over the circulation of the blood, have been strongly confirmed by the interesting microscopic observations of Dr. Thomson, Dr. Wilson Philip, and Dr. Hastings, for an account of which we must refer the reader to the writings of these distinguished physiologists.

It is, in the mean time, evidently impossible not to admit that the action of the heart and large arterial trunks, or *vis à tergo*, must assist in carrying on the capillary circulation. A constant supply of fresh blood is transmitted by each contraction of the heart, which must have the effect of distending and stimulating the action of the smaller vessels. When the contractions of the heart are unusually violent and rapid, the blood will no doubt be propelled through the small vessels, and especially through those within its vicinity, with a degree of force that will completely overcome the contractility of these vessels, and give them the appearance of passive canals; but this circumstance does not appear to us by any means sufficient to prove that under a quiet state of the circulation, and especially in parts of the body remote from the heart, the extreme vessels and capillaries have no control over the course of the blood: the reverse of this has, in our opinion, been satisfactorily established by the facts and experiments already adduced. We conceive, therefore, that it is more reasonable to admit the influence of both causes in the circulation of the extreme vessels, and that the advocates on each side of the question have been much too exclusive.

The preceding are highly important facts, which will require to be taken into consideration in investigating the nature of inflammation. It should also be stated, that according to the latest experiments, it would appear that the arteries do not terminate in exhalants, but that both exhalation and absorption take place through the pores of the thin coats of the vessels. (Magendie's Physiology, p. 353, 479, Dr. Milligan's translation.)

While we consider the independent vitality of the minute arteries as the most efficient agent by which they carry on the circulation, it is but reasonable to admit that the laws of capillary attraction may afford some degree of assistance; for the living body is never completely exempt from the influence of physical laws. Dr. Marshall Hall has lately made some interesting microscopic observations on the action of the capillary vessels. He describes them as a network of pellucid vessels, differing from the small arteries in the circumstance that they subdivide without becoming smaller, and freely anastomose with each other, like nervous plexuses, forming thus an intermediate system of vessels between the arterial and venous systems. He states several reasons for inclining to the opinion that they are rather passive than active canals, through which the blood is circulated by the impulse of the arteries, the absorbing action of the veins, and also by capillary attraction. The facts brought forward in support of this opinion do not, however, appear to us sufficiently conclusive to controvert the numerous proofs we have already mentioned in support of the opposite opinion; and we consider it, therefore, a subject requiring further investigation. Dr. Marshall Hall fully admits the contractility of the small arteries. (On the Circulation of the Blood, by Marshall Hall, M. D. &c.)

Dr. Reus, of Moscow, published, some years ago, an account of experiments tending to show that galvanism exercises a locomotive effect on the circulating fluids. This singular property has been more fully investigated of late by M. Dutrochet, (Nouvelle recherches sur l'Endosmose et l'Exosmose, &c. par M. Dutrochet, 1828,) who has made some very interesting discoveries respecting the circulation of fluids, and has applied them with considerable ingenuity to the functions of vegetable life. M. Dutrochet has ascertained that when two fluids of different densities are only separated by a thin bladder, they exercise a double power of attraction over each other, which leads to the formation of two currents passing through the bladder in opposite directions and of different strength: the necessary result is a greater accumulation of fluid on one side of the bladder, in the direction of the strongest current, and a diminution of fluid on the other side. He conceives this property to depend on differences of density, of chemical composition, and of states of electricity. He has demonstrated the existence of a double current of this description through the vesicular texture of vegetables, and he calls the introduction of fluids into the vesicles *endosmosis*, and their expulsion *exosmosis*. He endeavours to account in this way for the ascent and descent of the sap, and for the circumstance of the roots of plants taking always a direction downwards, and the stems a direction upwards. This property is shown to differ from capillary attraction. May not *endosmosis* and *exosmosis* be reasonably supposed to have some influence over the circulation in the extreme vessels in animals as well as in vegetables? This has already been made the subject of some highly interesting experiments by Dr. Faust* and Dr. Mitchell (On the Penetrativeness of Fluids—American Journal of Medical Sciences, vol. vii.) in America, and Dr. Stevens (Observations on the Healthy and Diseased Properties of the Blood) in our own country. These gentlemen have clearly proved that gases are subject to the singular laws of *endosmosis* and *exos-*

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* Experiments and Observations on the Endosmose and Exosmose of Gases, and the Relation of these Phenomena with the Function of Respiration—American Journal of Medical Sciences, vol. vii Philad. Nov. 1830.

mosis as well as fluids, and they have deduced from the facts they have observed a completely new and very ingenious theory of the function of respiration.

The connection and mutual influence of the two great systems, the vascular and nervous, on which mainly depend the functions of life in the higher classes of animals, has often been an interesting subject of inquiry with physiologists, and is one that involves considerations of the highest importance also to the pathologist. It may be necessary to premise that there are two great divisions of the nervous system, the first including the cerebro-spinal organs and their nerves, and the second the ganglionic system of the great sympathetic; and that the vascular system may be also divided into two sections—the circulation of the heart and large vessels, and that of the smaller and extreme vessels.

The heart and larger vessels receive but few nerves directly from the cerebro-spinal portion of the nervous system, their nerves being principally supplied by the ganglionic system of the great sympathetic, which appears to have the organic or nutritive functions of life more especially under its influence. The two divisions of the nervous system are, however, intimately connected by the numerous branches the great sympathetic receives from the spinal marrow, and by a few smaller branches coming from the brain.

There has been much difference of opinion among physiologists respecting the degree of influence exercised by the brain and spinal marrow over the organs of circulation; some concluding from their experiments that the action of the heart and blood-vessels is wholly independent of this portion of the nervous system; while others adopt, as the result also of experiments, a directly opposite opinion. The medium between these contradictory views approaches probably the nearest to truth; and the following facts may, we think, be considered as satisfactorily established by the joint testimony of experiment and pathological observation.* The action of the heart and large vessels is not immediately dependent on the influence of the cerebro-spinal nerves, for these organs continue to carry on the circulation after the brain and spinal marrow have been completely destroyed; they preserve, however, this independent power only for a short time, as their contractions gradually become weaker, and completely stop at the end of a few hours. It is evident, therefore, that the functions of these organs, although partially removed from the direct influence of the brain and spinal marrow, cannot be continued in full vigour and activity after the destruction of this important portion of the nervous system. We see, likewise, these positions clearly illustrated by the natural phenomena both of health and disease. The action of the heart is not perceptibly affected by the ordinary operations of the mind, while it is frequently either quickened, depressed, or totally suspended, on the occurrence of sudden and powerful emotions; the functions of the heart are also not disturbed by partial diseases of the brain or spinal marrow, but very extensive lesions of these organs lead inevitably to some alteration in the state of the circulation.

The circulation in the extreme vessels (arteries, capillaries, and veins) is also in a great measure independent of the direct influence of the cerebro-spinal portion of the nervous system, for when the communication of a part of the body with the brain and spinal marrow has been destroyed, as, for instance, in paralysis, the function of nutrition is still carried on, although with diminished activity. The blood-vessels are chiefly supplied with nerves from the great sympathetic; the nervous filaments follow the ramifications of the arteries, subdividing most minutely around them, forming plexuses and penetrating their coats; the nerves of the cerebro-spinal system are also largely distributed, along with the blood-vessels, throughout the texture of many organs, conveying additional stimulus, although, as just stated, not absolutely indispensable to the action of the vessels. It may therefore be truly said, that wherever there are blood-vessels there are also nerves, and that there is scarcely a particle of organized animal matter without nervous tissue.

It is not, therefore, surprising that the varied and important functions of the extreme vessels should be under the immediate and powerful influence of the nervous system, and more especially of the ganglionic nerves of the great sympathetic. This is rendered obvious by innumerable facts both in physiology and pathology. The activity of the circulation in these vessels, and the various changes which the circulating fluid undergoes in the process of nutrition, secretion, &c., are, it is well known, accelerated, retarded, or otherwise altered, according to various modifications of sensibility. A striking proof of the important offices performed by the nervous system in these functions is also afforded by the result of Dr. Wilson Philip's experiments on the influence of galvanism over the function of secretion. (Wilson Philip on the Vital Functions, c. v. p. 119.)

Some physiologists have conceived that the nervous system has even a direct influence on the blood in the extreme vessels, an opinion which Andral is inclined to favour, as will be seen by the following extract from his pathological anatomy:—"Barthez has said a great deal about a direct influence exercised by the nervous system over the blood: I grant that such an idea seems unfounded if we consider the blood only as it is in its great vessels; but in the capillaries, where it comes in contact with the solids and is confounded with them, where it manifests signs of vitality, and where in conjunction with the nerves it gives life to the organs it traverses;—in these, I say, who will venture to deny the influence of the nerves over it? In the capillaries is exerted in full force that law of mutual dependence that connects all the parts of the system, and makes of so many different elements but a single whole, of so many partial lives a single life. In them the nerves must act on the blood, as the blood acts on the nerves." (Andral, Pathological Anatomy, p. 660.)

It should be remembered, on the other hand, that the nervous system is immediately dependent on the stimulus of blood for the preservation of its power, for this is completely destroyed the moment the nervous centres are deprived of arterial blood: there is, therefore, no fact in physiology better established than that of the intimate connection and mutual influence on each other of the vascular and nervous systems. They are the two that are first developed in the embryo, and they fulfil the most important offices in all the phenomena of life. These considerations are of considerable importance to the investigation of disease, as it will be seen that the various morbid conditions of the sensibility constitute one of the essential features of the process of inflammation.

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* This is the conclusion Dr. Marshall Hall has adopted after repeating the experiments. An account of the whole controversy will be found in his valuable little Treatise on the Circulation of the Blood

We have next to consider the properties and uses of the blood. The ancients were so little acquainted with the structure and formation of the body, that perceiving the secretions and excretions generally vitiated in disease, they naturally considered the morbid conditions of the blood and other animal fluids as the primary and exclusive source of all diseases. After the humoral pathology had prevailed for many centuries, the rapid progress made in the science of anatomy and physiology about the time of Haller, led pathologists into the opposite extreme of referring exclusively all the phenomena of life, both in health and disease, to the action and various conditions of the solids; the humoral pathology became then completely exploded by the speculations of the solidists. A more careful and impartial investigation, however, of the properties and uses of the various constituent parts of the animal economy in modern times, has been followed by the adoption of more comprehensive views of the operations of life; and it is now satisfactorily proved that the animal fluids, and particularly the blood, exercise an influence fully equal, if not superior, to that of the solids. In consequence of the imperfect state of animal chemistry, no very satisfactory results have yet been obtained from the analysis of the blood in disease. There can be no doubt, however, from numerous recent observations, that it presents in many diseases a variety of remarkable changes in its physical characters: we must refer the reader for an account of these to the article BLOOD, MORBID STATES OF THE. Various alterations have also been discovered both in the chemical composition and physical properties of the other animal fluids as the effect of disease, and the HUMORAL PATHOLOGY is beginning to obtain, once more, the degree of attention to which, within rational limits, it is unquestionably entitled.

The blood has at all times been considered the chief support of life, and on this account, according to many, the seat of the vital principle. This is an opinion recorded in the most ancient books. We find in the Old Testament the following remarkable declarations of the inspired writers on this interesting point; "But flesh with the life thereof, which is the blood thereof, shall ye not eat." (Genesis, ix. 4.) "For the life of the flesh is in the blood." "For it is the life of all flesh; the blood of it is for the life thereof; therefore I said unto the children of Israel, Ye shall eat the blood of no manner of flesh, for the life of all flesh is the blood thereof."*

This opinion was embraced by Harvey, and in modern times has been warmly advocated by John Hunter. He considered, like some of the ancients, the principle of life to be a kind of distinct agent, independent of the conditions of matter, and endowed as it were with consciousness; he believed, however, this principle to reside chiefly in the blood, and made a great many ingenious experiments tending to support this opinion. Hunter's arguments in favour of the independent vitality of the blood, were its property of spontaneous coagulation, and of assuming under certain circumstances the most complete organization. When blood is drawn from the vessels, the globules, which consist of pure fibrine, are attracted together and disposed to arrange themselves in lines or fibres, constituting the crassamentum. This fibrous arrangement bears a great analogy to the fibres of muscles, which consist also chiefly of fibrine.† Many causes of sudden death, such as lightning, the bites of venomous animals, some acrid and narcotic poisons, by which the nervous action is suddenly paralysed, have also the remarkable effect of suddenly changing the composition of the blood, preventing its coagulation, and rendering it incapable of supporting life. Under similar circumstances, the muscles are also found relaxed and incapable of being excited by the accustomed stimuli. These facts have been supposed by Hunter to prove an identity between the property of muscular contraction and that of the coagulation of the fibrine:‡ this idea seems to be further supported by the circumstance of the chemical composition of the fibrine and of muscle being nearly the same.

There have been many speculations on the cause of the spontaneous coagulation of the blood, some ascribing it to its death, and others, like Hunter, to its life, whilst some have attributed it to the escape of carbonic acid gas. The remarkable property of spontaneous organization which has been so frequently observed in coagula of blood, seems directly opposed to the idea of its coagulation being the effect of its death; on the other hand, if blood is frozen and then thawed, it coagulates the moment it becomes liquid. We must admit that the blood was dead when frozen, and its coagulation after being thawed cannot therefore be reasonably attributed to its life. (Elliotson's Lectures, Med. Gazette, Dec. 1831.) The opinion of the coagulation depending on the escape of carbonic acid, which has been advanced by Sir C. Scudamore, is proved to be equally fallacious by the fact, that no carbonic acid has been detected in the blood by the most accurate chemical analysis. Dr. Stevens has attempted to prove that the fibrine partly owes its fluidity within the body to the circumstance of being held in solution by the saline substances contained in the serum; that this saline solution, together with the influence of the living principle and of constant motion, contributes to preserve its fluidity in the vessels, but becomes insufficient to hold it in solution when removed from the body. The insurmountable objection, however, to this hypothesis is, that fibrine is found to be totally insoluble in solutions of neutral salts. Dr. Bostock's explanation of this property of the blood appears to us on the whole the most rational. He states in his valuable System of Physiology: "Perhaps the most obvious and consistent view of the subject is, that fibrine has a natural disposition to assume the solid form when no circumstance prevents it from exercising this inherent tendency. As it is gradually added to the blood, particle by particle, while the fluid is in a state of agitation in the vessels, it has no opportunity of concreting; but when it is suffered to be at rest, either within or without the vessels, it is then able to exercise its natural tendency. In this respect the coagulation of the fibrine of the blood is very analogous to the formation of organized solids in general, which only exercise their property of concreting or coalescing under certain circumstances, and when those causes, either chemical or mechanical, which would tend to prevent the operation, are not in action." (Elementary System of Physiology, vol. i. p. 444.)

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* Leviticus, xvii. 11-14. This is the reason of the Jews refusing at the present day to eat the flesh of any animal which has not been bled to death, and of their having their own butchers.

† Dr. Hodgkin, having made numerous microscopic observations on the minute structure of various tissues and on the composition of some of the animal fluids, denies that the particles of the blood have a globular form, and gives a description of them totally different from that of preceding physiologists. (Catalogue of the preparations in the anatomical museum of Guy's Hospital, observations on section xi.)

‡ Dr. Stevens, who has made many experiments on the coagulation of the blood, mentions the following remarkable fact: "If at a certain period after the coagulation has commenced, we add muriate of soda or a saline solution to the coagulating blood, the moment that the fibrine feels the stimulus of the salt, the whole of it becomes suddenly solid; and I have seen the fibrine of inflammatory blood, which had been drawn during the hot stages of the marsh fever, contract on the application of salt with almost as much rapidity as the muscles, when we apply the same stimulus to the fibres in the living body."—Stevens on the Blood, p. 183.

[It is proper, however, to remark, that the blood may remain fluid in the vessels, and coagulate when removed from them long after the death of the body. In a case observed by the author, it flowed freely from the vessels of the brain, and coagulated fifteen hours after the total cessation of respiration and circulation, (*Proceedings of the American Philosophical Society* for May, June, and July, 1840, p. 216, and *Amer. Med. Intelligencer*, Aug. 1, 1840); and many such cases have been observed by others, (Dr. J. Davy, *Researches, Physiological and Anatomical*, Amer. Med. Lib. edit., Philad. 1840.) These facts would favour the idea, that the coagulation of the blood is a purely physical phenomenon.]

But the great argument in favour of the vitality of the blood is its property of spontaneous organization. When the fibrine and albumen [*liquor sanguinis*] are exuded in the form of coagulable lymph, it frequently happens that, although not in immediate contact with any of the surrounding solids, blood-vessels are seen shooting in every direction through the mass of concrete lymph, and it is gradually transformed into a new and perfectly organized living solid, having blood-vessels, lymphatics, and nerves, and performing all the functions of an original texture. The blood and the solids, when submitted to chemical analysis, are found to consist of the same proximate principles, and a similar analogy is observed in their physical structure, both consisting of globules variously united; these different circumstances made Bordeu apply to the blood the expressive appellation of liquid flesh, *une masse de chaire coulante.*

It must, therefore, be admitted that the blood contains within itself the elements of organization, whether or not it be the exclusive seat of the vital principle. The powerful influence of the blood on the vital properties is further proved by the fact, that the degree of vigour and activity of animal life depends in a great degree on the qualities of this fluid. If the blood contains a large portion of fibrine and red matter, the animal presents every sign of florid and exuberant health, and is predisposed to inflammatory affections: when the crassamentum of the blood is deficient and pale, and the serum preponderates, a languid state of health is the consequence, and a predisposition to diseases of debility. These opposite qualities of the blood are observed to depend in a great measure on its being brought into contact with either an ample or deficient supply of oxygen, provided always that a due quantity of nourishment is also received through the digestive organs. The vigour and activity of life can thus be partly estimated by the quantity of oxygen consumed, and also by the consequent degree of development of the animal temperature. This has led some to conjecture that oxygen was the principle of life; it can scarcely, however, be considered in any other light than that of a secondary agent; for if oxygen did not meet in the living body with some specific power modifying its action, there is no satisfactory reason why its influence on living animal matter should lead to results differing so remarkably in many respects from those it is observed to produce on inanimate matter.

Theory of Inflammation.—After the phenomena of inflammation had for a long period been referred to a vitiated state of the fluids, and to mechanical or chemical causes, pathologists began to perceive the impossibility of giving a rational explanation of all the morbid changes that mark the inflammatory process by any supposed state of the blood alone, and turning their attention to the condition of the vascular system, they fixed on an increased action of the blood-vessels as its proximate cause. It was found difficult, however, to reconcile the swelling of inflammation, which necessarily requires an increased capacity of the vessels, with the notion of an augmented vital action, which would imply an increase of their contraction. Boerhaave endeavoured to solve the difficulty by attributing the swelling and obstruction to a change in the texture of the blood itself, which, he imagined, became more thick and viscid, acquiring what he called a state of *lentor;* he supposed also that the increased action of the arteries forces the larger particles of the blood into vessels too small to receive them, which constituted the *error loci* of the mathematical pathologists; they conceived that the structure of the globules was very complicated, each red one consisting of six serous, and each serous of six lymphatic globules, for the conveyance of which, vessels of three different kinds and sizes were provided as channels of communication between the arteries and veins, so that if a globule got into a wrong vessel, it might obstruct all those behind it.

For this mechanical theory of Boerhaave, Cullen substituted his hypothesis of spasm and constriction of the small vessels, which, he believed, was sometimes the effect of direct debility, and connected with a diminished energy of the nervous power of the whole system, arising from the action of certain deleterious causes on the brain. The necessary consequence of this general spasm of the extreme vessels was a reaction of the heart and large vessels, which had the effect of solving the spasm; this was his theory of idiopathic fever. He conceived also, as another principle in the pathology of inflammatory affections, that there was a peculiar condition of the whole vascular system, which predisposed to and might be induced by local inflammation, and which constituted what he termed the *diathesis phlogistica;* that this consisted in an increased tone or contractility of the muscular fibres of the whole arterial system, which existed generally in persons of the most rigid fibres. The obstruction of the blood in inflammation was thus attributed to spasm; but it was obvious that a state of spasm would be directly exposed to tumefaction; and that, if the first effect of local stimuli were spasm, the very reverse of swelling and redness would take place, the blood being expelled from the vessels of the part, as is seen in convulsions, where it is driven from the surface to the centre of the body; that if also the spasm were the consequence of a previous congestion of the vessels, this congestion should be received as the proximate cause, and the spasm merely as an effect.

Although there exists, no doubt, a habit of body corresponding to the *diathesis phlogistica*, which may predispose to inflammation, it is likewise satisfactorily proved by general experience, that inflammation occurs much more frequently in constitutions characterized by lax, mobile, and irritable, than firm and rigid fibres; the inflammatory diathesis cannot, therefore, be always considered synonymous with the diathesis phlogistica of Cullen.

The great difficulty in all the theories of inflammation having been the manner of reconciling the increased action of the vessels, which supposes an increased contraction, and consequently a diminished capacity, with the swelling, which requires an augmented diameter of the inflamed vessels, several pathologists have had recourse to another hypothesis, by which the idea of increased action is set aside, and local inflammation is attributed to a diminished action of the vessels. This hypothesis was originally proposed about the middle of the last century by the Italian physiologist Vacca, and first advocated in this country by Mr. Allen of Edinburgh. According to him, the redness, heat, pain, and tumour are to be ascribed to an increased quantity of blood which the vessels contain in consequence of their relaxed state; he attributes those symptoms which had been usually accounted for by increased action, to this partial stagnation of the blood, together with a kind of struggle between the loss of power in the part, and the unusual stimulus to which it is thus exposed. (Thomson's Lectures on Inflammation, p. 68.)

This view of the subject had been adopted in a modified form by John Hunter, who supposed inflammation to be a disturbed state of parts which requires a new but salutary mode of action to restore them to their healthy state; inflammation is therefore rather to be considered a salutary operation than a disease. He describes the act of inflammation as an increased action of the vessels, which at first consists simply in an increase or distension beyond their natural size, this increase apparently depending on a diminution of the muscular power of the vessels, at the same time that the elastic power of the artery is increased in the same proportion: this is, therefore, something more than simply a common relaxation, and Mr. Hunter calls it an act of dilatation—an hypothesis, however, devoid of proof. He says that, owing to this dilatation, there is a greater quantity of blood circulating in the part, and that it passes more rapidly through the vessels; the swelling is also partly produced by an extravasation of coagulable lymph with some serum, the lymph differing from the common lymph in consequence of passing through inflamed vessels.

The theory of a diminished action of the vessels was embraced also by Dr. P. Wilson, [Philip,] (Treatise on Febrile Diseases,) Dr. Thomson, and Dr. Hastings, who all performed a variety of experiments in its support. Dr. P. Wilson first showed that he could create increased action in the capillaries without exciting inflammation; but whenever inflammation was established, he found the capillaries in a state of preternatural distension and debility; whilst the larger arteries experience an increase of action, which, by keeping up a strong *vis à tergo*, tends to augment the inflammation. If, however, the inflammatory action continues, the vessels immediately preceding the inflamed capillaries become also distended, and consequently debilitated: in short, according to Dr. P. Wilson, inflammation seems to consist in the debility of the capillaries, followed by increased action of the larger arteries, and is terminated by resolution, when the capillaries are so far excited, and the larger arteries so far weakened by the preternatural action of the latter, that the power of the capillaries is again in due proportion to the *vis à tergo*. He refers many of the more general phenomena of inflammation to the sympathetic influence of the nervous system.

Dr. Thomson draws from his experiments inferences rather at variance with those of Dr. P. Wilson, for he conceives that it is not necessary to the establishment of Mr. Allen's hypothesis to admit that the capillary circulation is slower in inflammation. "I am inclined to believe," says Dr. Thomson, "that a diminished velocity of the blood in the capillary branches is by no means a necessary, constant, nor even the most common effect of incipient and moderate degrees of inflammation." (Op. cit. p. 75.) He considers that the velocity is sometimes increased and sometimes diminished.

This difference in the statements of these two gentlemen induced Dr. Hastings to repeat their experiments, in order, if possible, to reconcile them: and he came to the following conclusion: "that certain stimuli applied to living parts produce an increased velocity of the motion of the blood and a contraction of the blood-vessels. During this state of excitement the part affected is so far from giving anything like the appearances of inflammation, that the size of the vessels is diminished and the part paler. But if the stimulus be long-continued or increased in power, the small vessels, which in the natural state admit only one series of globules, become so dilated as to allow an accumulation of a much less fluid and redder blood in them, which loses its globular appearance, and moves much more slowly than that which previously passed through these vessels: the part now appears inflamed; if the stimulus be removed, the vessels do not soon regain their original state; time is necessary to allow them to recover their contractile power, so as to prevent the impetus with which the blood is propelled by the heart and large arteries from keeping up the dilated state of the capillaries." "It may be logically inferred, therefore," says Dr. Hastings, "*that inflammation consists in a weakened action of the capillaries, by which the equilibrium between the larger and smaller vessels is destroyed, and the latter become distended.*" Dr. Hastings argues that Dr. Thomson's belief in the excitement of the capillaries in some cases of inflammation, arises from his having denominated a state of inflammation that which ought not to be so called, being only that temporary excitement of the capillaries generally preceding their debility, which is inseparable from inflammation. (On Inflammation of the Mucous Membrane of the Lungs.)

The late Dr. Parry of Bath, whose researches on the functions of the vascular system have deservedly attracted so much notice, necessarily rejected the opinion of diminished action of the capillaries in inflammation, since he denied that the capillaries possess any independent muscular power, asserting that the blood was propelled through them by the contraction of the heart alone. He attributed inflammation to an increased momentum of the blood in the part affected, and therefore to an increased passive action of the capillaries. This hypothesis has been strongly advocated by Mr. James, of Exeter, in his treatise on inflammation. The facts brought forward, however, in support of the opinion that the extreme vessels possess a contractile power, appear to us so convincing and satisfactory as to set aside completely the opposite theory.

In all the preceding theories the contractility of the vessels only seems to have been taken into consideration, whilst the other great vital property —the sensibility of the part—has been almost entirely overlooked. Sufficient attention also does not seem to have been paid either to the changes of the blood or to the modifications both in the structure and functions of the part which characterize inflammation, and vary considerably in its different periods. Each theory appears to contain much that is true, especially that of Dr. Hastings, but to be constructed on too narrow a basis, incapable of satisfactorily accounting for all the facts.

We have repeated the experiments with care, availing ourselves of many valuable suggestions gathered from the researches of some of the continental pathologists, especially those of Gendrin and Kaltenbrunner. The former has investigated with considerable attention the whole pathology of inflammation, and has given a luminous description of several important phenomena, especially those of suppuration; he adopts the opinion of an increased action of the vessels being the primary cause of inflammation. Kaltenbrunner's microscopic researches have been much more minute, accurate, and conclusive than those of any of his predecessors, and afford an excellent specimen of an experimental inquiry conducted in a truly practical and philosophical spirit; he confines himself, however, to a description of the obvious phenomena, without entering upon any theoretical reasoning. We have verified by our own observations the correctness of nearly all Kaltenbrunner's facts; but as the limits of this article do not admit of a detailed account of experiments, we must reserve this for some future occasion, and shall proceed to give a description of the various phenomena of the inflammatory process, and of the conclusions we have adopted respecting their nature, founded upon the facts observed.

When a stimulus is applied to a living part, the first effect produced is an excitement of the sensibility of the part, and with some exceptions, a consequent degree of pain: this, however, soon subsides if the irritation be only slight or temporary; but when the effect of the stimulus is either severe or prolonged, the contractility of the vessels of the part is next roused into increased action; the necessary result of this morbid excitement of the sensibility and contractility of the vessels is a more rapid flow of blood to the part, which, acting itself as a stimulus, tends still more to quicken the circulation: there is consequently a considerable influx of blood in all the vessels, capillaries, and veins, to the amount, perhaps, of double or triple the usual quantity: and as the vessels of the surrounding parts do not partake of this increased action, the blood of the irritated vessels is not carried off as quickly as it arrives, and must inevitably soon accumulate. Blood-vessels, like all other contractile and elastic tubes and tissues, are capable of having their capacity and other dimensions increased within certain limits, without any sensible diminution of their power of contraction or of their mechanical strength; the stimulated vessels thus adapt themselves to the increased flow of blood by becoming enlarged, whilst they still preserve their control over the circulating current. Vessels, which in their natural state were scarcely perceptible, owing either to the admission only of a thin colourless blood or to their extreme tenuity, now become dilated and visible, a red and more viscid blood being propelled through them. Boerhaave and the mathematical pathologists had accurately noticed this admission of the red globules into vessels from which they were previously excluded, calling it an *error loci.*

The pressure of the blood is sometimes greater, however, than the vessels are able to resist; this more particularly happens when the irritation has extended to the larger arterial branches and to the heart, so as to excite a strong *vis à tergo.* The strength and action of the smaller vessels diminish as their distension increases; the circulation, which was at first accelerated, now becomes gradually slower, and may continue in a languid and oppressed state for a considerable length of time without being completely interrupted. Under these circumstances the healthy functions of the part are necessarily more or less impeded; the blood ceases to undergo its usual change from arterial to venous; the red globules which were before confined to arteries, are now seen circulating in the small veins; these globules are more numerous and of a more vivid red; the viscidity and coagulability of the blood seem augmented by a decrease in the proportion of its serum; and the globules, having a tendency to unite together, become less distinct; the functions of nutrition and secretion are also partially or wholly suspended.

The part affected now presents the following morbid conditions: an increased influx of blood and turgid state of the vessels—some degree of swelling and pain—an increase of heat, and, in certain textures, of redness, which disappears on pressure—the circulation either much quickened, or slow and embarrassed, with suspension of the healthy functions. These changes constitute a distinct period of disease, which has too often been mistaken for inflammation, but which it is highly important should always be distinguished as its previous stage only, and may be named *active congestion*. The existence of a morbid state, such as we have just described, is of common occurrence in a variety of diseases, and frequently subsides without passing into inflammation. When, however, by the increase of the diseased action, inflammation supervenes and is fully developed, a series of perfectly new and distinct morbid phenomena are observed, which will be presently noticed.

Congestions are sometimes formed, however, in a different manner. If the vessels of a part (arteries and veins) have been much weakened, as happens from a variety of causes, or if there be any obstruction to the return of the blood through the veins, an accumulation of blood, a languid embarrassed circulation, vascular turgescence, and several of the other symptoms of congestion, will necessarily follow, without requiring the previous application of a stimulus. The increased influx of blood sometimes proves a sufficient stimulus to excite a reaction in the vessels of the part, an accelerated circulation, and a state of active congestion, which may lead to inflammation. In other cases, however, no reaction takes place; the vessels remain in a turgid, loaded, debilitated condition, with a languid circulation, constituting a *passive* form of congestion. The characters of these and of some other varieties of congestion will be more fully examined in another place.

When congestion begins to subside, a diminution in the activity of the circulation and influx of blood is first observed at the circumference; the blood seems to reflow from the circumference towards the centre; the swelling, pain, heat, and other symptoms gradually disappear. The resolution of congestion is generally promoted by critical discharges. In some cases there is a slight exhalation of a serous or sanguineous fluid either on the surface of the part or in the interstices of the vessels; an exudation of small red scales is sometimes perceptible through the microscope. The congested vessels may be relieved by a profuse flow of the natural secretions, as is frequently seen on the surface of mucous and serous membranes, or else by spontaneous hemorrhage.

It is important not to mistake for congestion or inflammation various changes in the state of the circulation, that sometimes immediately follow the application of certain stimuli to a living part, and are only of a temporary nature. Simple compression is sufficient to cause a momentary interruption of the circulation, and stagnation of the blood; the application of muriate of soda to the web of a frog's foot is followed by a diminution of the velocity or a complete stoppage of the circulation, and a remarkable increased redness of the blood; the immediate effect of a slight wound is an accelerated circulation, an increased flow of blood, redness, and other symptoms of incipient congestion; alcohol produces similar results, and sometimes a constriction of the vessels. All these changes, however, are only the immediate consequences of the mechanical or chemical action of the stimulants on the vessels, and of temporary nervous irritation, and do not of themselves constitute congestion or inflammation. When the irritation is slight, the increased activity of the vessels and influx or stagnation of blood soon disappear, after the removal of the irritating cause; but if the irritation has been prolonged or severe, and particularly if it has occasioned any extensive and permanent injury to the texture of the part, a reaction takes place soon after the changes just described have subsided, and a new process, *essentially vital*, is set up, intended to remove the irritating cause, or repair the injury it has inflicted; the circulation is consequently observed to assume again an increased activity, and the regular symptoms of congestion or inflammation are gradually developed. This is an important circumstance attending the process of inflammation, which had been noticed by Dr. Hastings, but has been since more clearly and accurately defined by Kaltenbrunner; and mistakes have no doubt been made in several accounts of the theory of inflammation from its having been overlooked.

The interval between the application of a stimulant and the development of the regular congestive or inflammatory process, may be considered as a period of *incubation*. The duration of this period is very variable; on the edges of wounds, where it is well marked, it may last several hours. The inflammation, however, does not always show itself in the part to which the exciting cause has been first applied, but in some other more or less remote; a variety of medicinal and poisonous substances applied to the external or internal surfaces of the body, frequently excite irritation or inflammation either in some of the secreting surfaces and organs, in the brain and nervous system, or in the heart and large vessels; and they produce this effect either by being absorbed and conveyed with the blood, or by their direct impression on the nervous system. Some animal poisons excite inflammation both in the part to which they are immediately applied, and in remote organs, as happens with the virus of hydrophobia, variola, &c. This secondary or sympathetic inflammation is not always the effect of irritating but frequently of depressing agents, acting on distant parts; a state of debility, or the suppression of the functions of one organ, becomes thus a very common cause of congestion and inflammation in another. All causes that operate in lessening the circulation on the surface or at the extremities of the body tend to produce determination of blood, and an inflammatory reaction in some of the internal organs. The slow and long-continued influence of such causes often gives rise to continued fever; or, when more sudden and active, to local inflammation.

In all these cases a greater or less period of time may elapse between the application of the exciting cause and the development of the disease; this is particularly the case with certain animal poisons, which may remain for some time circulating with the blood before they produce their specific effects. The consideration of the symptoms, duration, and treatment of the period of incubation, embraces some highly interesting questions, especially with respect to contagious diseases, as Dr. Marsh has shown in an excellent essay on this subject, published in the Dublin Hospital Reports.

We are next to consider the morbid changes that occur when congestion passes into true inflammation. If the action of the irritant be either violent or repeated, the appearances characteristic of active congestion extend from the centre to the circumference over a larger surface; the swelling and other symptoms increase in intensity, until the vessels are at last so gorged with blood that the strength and activity of their contractile fibres are overpowered: the vessels become therefore less and less able to resist and propel the current of blood, until its motion completely ceases; the blood then stagnates in the vessels, where it undergoes certain changes in the composition. This stagnation of the blood does not take place in the whole extent of the inflamed surface at once; the circulation first becomes slower, and the blood stagnates in some of the vessels at the centre; it then stops in others, forming sometimes several small nuclei of stagnation, which decrease in number and size towards the circumference, where the circulation continues more accelerated, and the part is in a state of active congestion. These changes occur first in the weaker vessels (the capillaries and veins), and afterwards in the arteries.

The following are the alterations observed in the composition of the blood; as the heat and other symptoms increase, the blood becomes less serous, more viscid and coagulable, and of a more vivid red; its course is altered, and a number of the globules are seen agglutinating together so as to form minute cylindrical clots; these are pressed in small columns from the capillaries into the veins, and move slowly in various directions, oscillating backwards and forwards until they become motionless; the blood is then evidently decomposed, so that the globules and serum can no longer be distinguished from each other, and it presents a red homogeneous coagulated mass, a part of the serum being generally expressed and effused around it. Motion, it is well known, is indispensable to the preservation of the globular appearance of the blood. A momentary vacuum is sometimes observed in the vessels between these coagula.

Another important occurrence, at this stage of the inflammatory process, is the bursting of a number of the over-distended vessels, and the extravasation of the blood in the surrounding texture, from which it is inferred that a diseased state of the coats of the blood-vessels is one of the immediate effects of inflammation, not less important than the changes in the composition of the blood. The acute inflammation of a large blood-vessel is characterized by redness, rugosity, thickening and softening of its internal membrane; the coagulated blood either adheres to it immediately, or through the intervention of a layer of effused lymph; the middle and outer coats are also injected, thickened, and much more friable; and the whole texture of the vessel having lost its density and elasticity, is very easily torn. We may safely conclude that the inflammation of smaller vessels will be attended with nearly similar changes of structure.

The points of stagnation are easily distinguished by their more vivid red colour, and the redness differs from that of congestion in not being removed by pressure. The colour varies, however, considerably, according to the intensity of the inflammation, the texture of part, and the nature of the exciting cause. In very intense inflammation there is a livid red, which becomes black in gangrene. Muriate of soda produces a dark purple red; alcohol a bright clear red, and muriate of mercury a brown dusky red. The rapidity with which the course of the blood is interrupted, the number and extent of the points of stagnation, depend likewise on the same causes. When the inflammation is intense and the circulation very rapid, the blood does not stagnate so soon; but the points of stagnation are more numerous and extensive. When alcohol is applied to the web of a frog's foot, the circulation is quickened, and after some time a few points of stagnation may be seen; a fresh application of alcohol to the same part is followed by an increased activity of the circulation; the small coagula previously formed are sometimes again set in motion by the increased force and velocity of the current of blood, and the obstruction of the vessels is thus removed. Any new interruption in the course of the blood will take place more slowly, in proportion as the activity of the circulation is kept up by fresh applications of alcohol. The same results follow the infliction of wounds of different degrees of severity, and the application of other stimuli. It has been ascertained by Kaltenbrunner, that in highly vascular organs, in which the circulation is very rapid, such as the lungs and the mesentery, more time is required for the perfect development of the inflammatory process, than in organs whose circulation is more slow, such as the liver; but that when the inflammation is once established, it is much more intense in the former than in the latter. In cold-blooded animals, the susceptibility to the influence of stimulants being comparatively feeble, the circulation is only moderately increased under their application. Inflammation is on this account quickly established by the stagnation of the blood, but seldom violent. It may be stated as a general principle, that the rapidity with which the inflammatory action is fully developed is in the *inverse* ratio, and the violence and extent of the inflammation in the *direct* ratio, of the activity of the exciting cause.

It has already been observed that the blood ceases to undergo its change from arterial into venous during congestion and inflammation, and that the functions of nutrition and secretion are also completely suspended. There is sometimes also an apparent absorption of certain portions of the inflamed tissue; the stellated black spots of the frog's web gradually disappear, when the blood is kept for some time in rapid circulation through its vessels, and small particles of the pigmentum may be seen carried away by the current of the blood. The fat of the mesentery and the earthy matter in bones is removed in a similar manner.

[On the inner surface of the walls of the dilated vessels, colourless corpuscles are seen to accumulate during the retardation of the flow of blood; and these have been regarded by Dr. Williams (*Op. cit.*) as new formations occurring at the moment. Mr. T. Wharton Jones, however, who has directed special attention to this point, ventures to maintain, that the colourless corpuscles, which are observed to accumulate on the walls of the vessels are no new formations called forth at the moment; and that they already exist in the blood,—that when the velocity of the stream of blood is great, the colourless corpuscles are mingled, and carried along, with the red corpuscles, but when the velocity of the stream is diminished from any cause — whether one of a temporary nature or that leading to inflammatory congestion—the colourless corpuscles become extricated from among the red ones, and come in contact with the walls of the vessels, where, rolling slowly along or actually remaining stagnant, they accumulate in great numbers. (Report, in *Brit. and For. Med. Rev.* for April, 1844, p. 593.)]

Another striking phenomenon is the formation of new canals or vessels by globules of blood bursting through the sides of a vessel and forcing a passage for themselves through the cellular texture into another vessel. A considerable number of new canals are sometimes formed by this mechanical process, through which the blood continues to circulate. This interesting phenomenon has been frequently observed by Kaltenbrunner in the inflamed mesentery of the rabbit. We have not had an opportunity of verifying it; but it is easy to conceive a number of the small delicate cells of the cellular tissue being united together by the forced passage of the blood, and forming new tubes. This is strictly analogous to what takes place in the organization of coagulable lymph, where the globules of the blood may be seen forming new passages for themselves by shooting in every direction through the mass of soft lymph.

Beside the extravasation of blood into the parenchyma of the inflamed part, already noticed, there is also a certain degree of interstitial effusion. In all animal tissues, during health, there is a constant exhalation of a fluid in the form of vapour between their fibres or laminæ. Gendrin gives the following description of the section of an inflamed part. Towards the centre it exhibits an infiltration of nearly pure blood, disposed in small coagula, and having sometimes a globular appearance, these coagula being surrounded with a gelatinous fluid. In some cases, instead of red blood, there is found a yellowish semi-concrete fluid resembling fibrine, and when inspected with the microscope, apparently partly composed of globules. On the outside of this concrete deposit, there is a reddish fluid half serous and half gelatinous, containing only very few globules; and quite at the circumference there is found pure œdema, with which almost all inflamed parts are more or less surrounded.

We have thus given an account of the various local effects which have been ascertained by observation and experiment to follow the application of stimulants to the living body, from the slightest degree of irritation to the perfect development of inflammation. It has been shown that a morbid excitement of the sensibility is the first effect arising from the application of stimulants, and that from which all the other phenomena of inflammation seem to derive their origin: the diseased action, moreover, never completely subsides until the sensibility has been restored to its normal state, so that this morbid condition of the sensibility may be considered as operating in a manner strictly analogous to the *ideal thorn* of Van Helmont. Other morbid agents act in depressing the sensibility and causing a diminished vascular action and a stagnation of blood, which is often followed by inflammatory *reaction.* This primary influence of the sensibility over the phenomena of inflammation is a circumstance which does not appear to have received hitherto the degree of attention it deserves. It will be seen hereafter that all the modifications of inflammation may be traced to some of the infinite variety of morbid conditions which the sensibility is capable of assuming. The intimate connection between the vascular and nervous functions, and the influence especially of the nervous system over the circulation of the extreme vessels, strongly corroborate the accuracy of the preceding views.

In considering the action of stimulants on the animal economy, it appears also that sufficient attention has not been paid to the fact that they excite a series of distinct morbid changes, passing gradually into each other, and whose characteristic differences have not been hitherto well defined. Genuine inflammation is never established instantaneously, but is always preceded by certain deviations from healthy action, which constitute preliminary stages. We conceive, therefore, with Kaltenbrunner, that the morbid changes which lead to inflammation may be divided into the three following periods.

1. A period of *incubation*, variable in its signs and duration. A better knowledge of the pathological condition of the system during this period might lead to the adoption of means capable of preventing the development of disease, and of destroying it as it were in embryo.

2. A period of *congestion*, characterized, first, by an increased activity of the vessels and influx of blood—various degrees of turgescence, swelling, heat, redness, and pain—interruption of the healthy functions of the part—and, secondly, as the congestion increases, a laboured slow circulation arising from the over-distension of the vessels, and increased thickness and viscidity of blood. There is yet, however, no change of structure in the part, nor formation of new products; the circulation, although slow, is still carried on or only very partially interrupted, and the affection may subside by critical secretions and hemorrhage.

3. The period of *inflammation*, which is characterized by an entirely new order of morbid changes. The circulation is completely interrupted — the blood coagulates, clogs the vessels, and stagnates in several points of the inflamed part—the coats of the vessels are diseased—some of the vessels are ruptured, and there is extravasation either of blood or coagulable lymph in the parenchyma—lymph and serum are also exuded, and the deposition of these new products leads to

a decided change of structure—the healthy functions of the part are completely suspended, and some of its constituents, such as the pigmentum and adipose matter, are sometimes absorbed—new vessels are also mechanically formed by the blood forcing itself a passage through the delicate areolæ of the cellular texture. All these changes are attended with a considerable increase of the swelling, heat, redness, and pain.

Congestion and inflammation pass so gradually into each other, that they are necessarily always combined, and it may often be extremely difficult to draw an exact line of demarcation between them. The stagnation of the blood, effusion of blood, lymph, or serum, either by exudation or rupture of the vessels, the changes in the structure of the part, and formation of new products, may generally be considered, however, as the pathognomonic signs of inflammation. The interruption of the circulation and extravasation of blood are not sufficient of themselves to constitute inflammation, since they are observed to take place in many cases of local or general vascular debility, the very opposite of inflammation, as, for instance, in ecchymosis, scorbutus, &c. It is only when these symptoms have occurred in conjunction with a series of certain other morbid actions, both preceding and following them, that they can be said to indicate inflammation.

It is assuredly neither rational nor philosophic to apply to these varied morbid phenomena of the inflammatory process but the one hypothesis of either increased or diminished action. It appears also incorrect to describe vessels, which performed their functions efficiently during health, as affected with *direct* debility, because they are unable to perform double their usual labour with equal efficiency in disease, as is the case with the vessels of an inflamed part. It is impossible to deny that, unless under peculiar circumstances forming exceptions to the general rule, the action of the vessels is at first greatly and powerfully increased, and it is only when they become clogged and over-distended by an excess of blood, and by blood less thin and fluid than that which they contain in health, that being no longer able to contract, they become passive. Direct debility of the small vessels cannot, therefore, correctly be admitted as the primary cause of inflammation, since we only see debility occur as a *secondary effect*. Weak and relaxed vessels are themselves susceptible of increased action, and often in a much greater degree than vessels in the opposite state; for it is well known that constitutions in which the fibre is lax and delicate are generally characterized by a much higher degree of mobility and irritability, and are much more predisposed to inflammation than constitutions endowed with a more firm and rigid texture of the solids. While delicate and sensitive vessels are easily roused into excessive action, they are less able to sustain it, and are, therefore, more readily overcome by the increased flow of blood, and more quickly affected with inflammation: this is fully exemplified in infants. But although the weak and delicate structure of vessels predisposes them to inflammation, still increased action is a primary condition necessary in most cases to its development. We may also add, in opposition to the hypothesis of direct debility of the vessels, that the exciting causes and treatment of inflammation coincide better with the idea of excessive than defective action.

The following summary gives a condensed view of the series of morbid changes that have been described as occurring in the inflammatory process:—Increased sensibility of the part, followed by increased action of the vessels—quickened circulation—increased influx of blood—dilatation of the small vessels and capillaries—admission of red blood into vessels previously colourless—turgescence—swelling—and sometimes a slow and embarrassed circulation—*active congestion.* If the diseased action continues, the contractility of the vessels is paralysed by their over-distension—blood stagnates and undergoes changes in its composition—disease of the coats of the blood-vessels—rupture of many of the vessels—extravasation and effusion of blood, coagulable lymph, and serous fluid—changes in the structure of the part affected—*inflammation.*

This view of the theory of inflammation has the advantage of accounting in the most satisfactory manner for many of the modifications of common inflammation. The exciting cause may be of such a nature as at first to stimulate both the sensibility and vascular contractility of the part, and induce a degree of congestion. But if its action be increased beyond a certain point, it may have an opposite effect in lessening both the sensibility and vascular contractility, and inducing a state of torpor; the blood will then stagnate, not from excessive irritation and over-distension of the vessels, but in consequence of their deficient vitality and relaxed condition. This is frequently the mode of operation of cold, and of several stimulating narcotics and animal poisons, which excite a peculiar form of low subacute inflammation, requiring a specific mode of treatment.

In another variety of inflammation, the sensibility is directly weakened or completely paralysed, without previous irritation. There is at first no increased action of the vessels, or greater influx of blood; but the contractility and sensibility of the vessels being lowered or nearly paralysed, the current of the blood becomes extremely languid, and finally stops; reaction is generally excited in this case by the *vis medicatrix naturæ*, and a low kind of inflammation supervenes, which may terminate rapidly, either in unhealthy ulceration or gangrene. The living parts are then separated from the dead by a line of acute inflammation. The nervous power and vascular action of a part may be impaired or destroyed, as just described, by causes acting more immediately through the medium of the nervous influence, such as electricity, galvanism, intense cold, some very active narcotics, the ligature of large nerves, &c.; or by noxious substances taken into the blood, and materially altering its properties; or else by a deficient supply of arterial blood in consequence of the ossification and other organic diseases, or the pressure or ligature of large arteries. It remains, however, yet to be decided, whether the blood may not be considered the sole vehicle of all morbid agents, without its being necessary to have recourse to nervous agency in order to explain their effects. The great rapidity of action of some deadly poisons seemed to favour the opinion of the nervous influence being exclusively the medium through which they operate. It would appear, however, from some recent observations, that morbific principles can be conveyed by the blood to remote parts of the body much more rapidly than was formerly imagined. This is an intricate but highly interesting question, requiring to be submitted to further investigation.

The preceding theory of inflammation enables us also to give a satisfactory explanation of the opposite mode of treatment often required in the different stages and modifications of inflammation. It is thus easy to explain, for instance, why local and general depletion are useful in the first stage of inflammation, in lessening the irritation and increased action of both the nervous and vascular systems; in reducing the quantity of the blood, and thus preventing the over-distension and obstruction of the vessels, and the extravasation consequent upon their rupture; in lessening, moreover, the viscidity, thickness, and coagulability of the blood, which is the constant effect of free depletion: why, on the contrary, in cases in which the exciting cause has more directly weakened the nervous and vascular action of the part, as is the effect of cold and of a variety of poisons, stimulants may be required from the beginning;—how, also, stimulants, when cautiously used, may in the latter stages of inflammation assist in restoring the weakened or oppressed action of the nervous and vascular systems, and in this manner facilitate and hasten the elaboration and expulsion, or the absorption of the morbid products, by which means the sequelæ of the disease are removed:—and why, also, the application of a stimulus, different from that which produced inflammation, will sometimes bring on resolution.

Having followed the changes that attend the inflammatory process up to its full development, we proceed to trace them in its ulterior stages. Before the inflammation has reached its greatest height, and any considerable change of structure has taken place, it may gradually subside. The frequency of the circulation begins to decrease at the circumference, and there is a reflux of the blood towards the centre, there are critical exudations through the sides of the vessels, consisting of a thin serous or sanguineous fluid, poured out on the surface or in the cellular texture of the part similar to those already described in congestion; there may be profuse exhalation of fluids on the secreting surfaces; the small coagula of lymph and blood contained within the vessels, or deposited in the parenchyma, are softened and removed, either by the impetus of the current of the blood within the vessels, or by interstitial absorption. The tumefaction, heat, redness, and pain, gradually subside: this is the most favourable mode of termination of inflammation, called resolution.

In more severe inflammation, when the texture of the part has suffered greater changes, it is frequently restored to its healthy state, and the effects of the disease are removed by a different process, which leads to the formation of a new fluid called pus. For a long period suppuration was believed to be the result of a dissolution of the living solids after they had been broken down by inflammation, and pus was supposed to possess a corroding power, by which it continued the dissolution. These opinions were, however, completely set aside by the more rational theory of this fluid being formed by a process of secretion. The origin of this morbid fluid has been traced still further by Laennec and Gendrin, who consider suppuration as the result of a direct conversion of the coagulable lymph of inflammation, and of the fibrine of the blood, into pus. Laennec believed pus to be simply softened coagulable lymph, coagulable lymph is found by analysis to consist not only of the fibrine of the blood, from which it differs by its lesser consistency, but also of a small proportion of albuminous serum; it is supposed therefore to be formed of an intimate combination of the fibrine of the blood with a small portion of albumen, rendered more viscid and coagulable by the vital influence of the inflammatory action, and deprived also of the colouring matter. The opinion that pus is formed directly from the blood by the fibrine simply undergoing some slight modifications in its properties during inflammation, is supported by the following interesting experiments of Gendrin, which will require, however, to be repeated by others before the important conclusions to which they lead can be considered as fully established (Histoire Anatomique des Inflammations, vol. ii. p. 470.)

If any portion of an artery or vein be included between two ligatures, the intercepted blood at first coagulates; a portion of the serum is absorbed; a slight degree of inflammation is excited in the inner membrane; the globules of the coagulum lose their colour; a thin stratum of coagulable lymph is deposited on the sides of the vessel, forming a medium of adhesion between the clot and the internal membrane; and the clot itself becomes gradually organized. There is in this instance adhesive inflammation, and organization of the blood, without suppuration. But if a stimulating injection be thrown into a portion of a blood-vessel, the circulation having been previously suspended by means of ligatures, and if, after it is withdrawn, blood be again admitted and retained within the vessel, a more violent degree of inflammation is excited on the internal membrane, instead of the coagulable lymph, and the entire clot becoming organized, they are observed to acquire less consistency; small yellow globules are soon perceived between their layers, and they gradually undergo a more or less complete conversion into genuine pus. It is stated that these successive changes can be very distinctly watched with the aid of the microscope, and that they may sometimes be observed in cases of aneurism and phlebitis. If blood taken from one dog be injected into the cellular texture of the axilla of another, it soon coagulates, a slight degree of inflammation takes place, and the injected blood is gradually absorbed; but if a higher degree of inflammation is excited by any stimulating injection, or the passing of a seton, the blood, instead of being absorbed, is rapidly converted into pus: it would appear, therefore, that a certain degree of inflammation is indispensable for the transformation of extravasated blood lymph into pus.

It is deserving of notice that venous blood appears to possess a greater tendency to conversion into pus than arterial, while the latter is much more disposed to become immediately organized; and likewise that suppuration is favoured by a high degree of inflammation, whilst immediate organization is more generally the result of moderate inflammation: these considerations point to a variety of important practical precepts.

Suppuration, however, is not merely the result of the conversion into pus of a mass of extravasated blood or coagulable lymph, but takes place both on the surface and in the interior of inflamed organs by a regular process of secretion, through the medium of vessels either previously in existence or newly formed. It constitutes in this manner a new function, which sometimes persists for a considerable period after the inflammation has subsided, as is seen in fistulous sinuses, chronic ulcers, setons, &c. Gendrin has minutely investigated the nature of this process by exciting violent inflammation in the web of a frog's foot and in the mesentery by means of a seton, the actual cautery, or boiling water, and watching its progress with the microscope. The following interesting account of the result of these experiments is favourable likewise to his opinion of the globules of fibrine being directly converted into globules of pus. (Op. cit. vol. ii. p. 477.)

After the inflammation has attained its height, the circulation remains for some time stagnant, the vessels and intermediate cellular texture being both filled with coagulated blood and lymph; the colouring matter gradually disappears, the part assuming more and more an opal tint; small yellow soft molecules may be seen interspersed through the coagulum, and some of them agglomerating in large globules evidently purulent. A slow degree of motion gradually becomes apparent by the oscillation of some of the globules in the old vessels; whilst a passage seems to be made for others through the mass of softened lymph by the formation of new canals, especially near the surface. It is stated, moreover, that the various alterations which the globules of the blood undergo during their conversion into pus can be distinctly followed by the eye, especially in the blood-vessels of the mesentery; that the globules are first seen corrugating themselves and separating from their colouring envelope; that they then lose their transparency, becoming, as they approach the edge of the wound where the irritation is the strongest, more opaque, larger, softer, and completely converted into purulent globules. Small lacerated portions of the substance of the part are in some cases apparently dissolved by and carried along with the pus. The vessels soon become more distinct and numerous, and the circulation more regular, although it continues very slow as long as the vessels convey pus. As the swelling subsides by the discharge of the pus, the vessels in the centre re-admit red blood, and their circulation becomes more active. As soon as the suppuration ceases, a coagulable globular lymph of a pale flesh colour, and covered with red streaks, is exuded on the surface of the wound instead of pus; the red streaks are converted into vessels, by means of which the stratum of lymph becomes organized, and the cicatrization is completed. When suppuration is prolonged and rendered habitual by artifical means, the vessels secreting pus are increased in size and number, and assume a more regular action.

Gendrin concludes from his experiments that the conversion of the fibrine of the blood into pus takes place independently of the action of the vessels or of any vital influence of the inflamed part, and by a mere chemical process not yet well known. This is an opinion, however, which we think scarcely admissible, for it would be extremely difficult to account for the great varieties observed in the qualities of pus in different forms of inflammation, and especially for its *specific* properties in certain diseases, on any other principle than that of referring them to the vital influence of the diseased vessels, as at least one of their essential causes.

The preceding, which is the most simple form of the suppurative process, usually attends mild inflammation. In violent inflammation, when the parenchyma has been much lacerated by the extravasation of blood and coagulable lymph, instead of the pus being entirely collected in vessels, it accumulates towards the centre of the tumour, where it is mixed with loose fragments of cellular tissue and coagulated blood. When the loss of substance has been considerable, the circulation is only partially restored, and the parts destroyed may undergo a degree of putrid fermentation; the pus itself assumes a dark livid colour and an acrid unhealthy character, and this leads to gangrene or sphacelus. Suppuration in this case takes place more by a process of decomposition than of regular secretion; it is a species of imperfect suppuration.

The alterations which the blood and other fluids undergo in different textures during inflammation, correspond in general to those just described as occurring in the cellular texture; they present however, a few modifications, which we shall notice in this place, in order to give a complete and connected view of the nature of the inflammatory process.* When a serous membrane, as, for instance, the pleura, is slightly inflamed, there is, first, an effusion of a yellowish serous fluid, slightly viscid and alkaline, and consisting almost entirely of a small portion of albumen held in solution by water. As the inflammation increases, the surface of the membrane is lined with a thin layer of a soft viscid substance of a greyish colour, consisting of a semi-transparent jelly, interspersed with small globules of a yellow tint, and characterized by the property of spontaneous coagulation. This coagulated substance increases in thickness, viscidity, and density with the inflammation, constituting on the third or fourth day a distinct plastic, laminated, pseudo-membrane. When submitted to analysis, this membrane is found to consist of fibrine with a small proportion of albumen, and corresponds in every respect with the coagulable lymph of phlegmonous inflammation; it is insoluble in water, otherwise it would be dissolved by the serous fluid contained in the cavity of the membrane, instead of adhering to its surface. The serous fluid poured out at this period of the inflammation loses its transparency, becomes turbid, viscid, and more alkaline; its albumen is considerably increased, and it deposits a greyish flocculent coagulable matter, exactly similar in its properties to false membrane, containing only a larger proportion of albumen and aqueous fluid. When the inflammation has lasted several days, the liquid assumes a yellow or greenish tint, and there is added to the coagulable lymph a yellow viscid matter, which is deposited in a pulverulent form, is soluble in alkalies when dried, and when examined by the microscope, presents all the appearances of globular pus. A large proportion of this last-mentioned matter is formed in violent inflammation, giving the effused fluid a well-marked purulent appearance, and a quantity of pus is sometimes deposited, as pure and genuine as that coming from an abscess. The inflammation of all serous membranes is followed by similar results. In the inflammation of synovial membranes the viscid, oily, albuminous synovia is likewise converted into coagulable lymph or pus, according to the intensity of the inflammatory action.

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* See Gendrin. Op. cit. Alterations des fluides, &c. vol. ii. p. 492, from which the facts contained in the following account have been partly derived.

The fluid secreted by mucous membranes consists, in health, of animal mucus held in solution by an aqueous fluid, and containing a small quantity of saline matter; the proportion of these ingredients varies in the different mucous membranes, and other elements are added to them in some, such as muriatic acid in that of the stomach, a sebaceous matter in that of the ear, &c. In active congestion or commencing inflammation, there is generally more or less increase of the natural secretion; it has in ophthalmia the appearance of thin viscid yellow mucus; in coryza it is more fluid and of a yellow white; in bronchitis it is transparent and viscid, like the white of an egg mixed with water; in diarrhœa it is very watery and copious, with white flakes floating in it; it is also more or less tinged with bile. In inflammation of the vagina and urethra it is thin, white, and transparent; in inflammation of the urinary bladder it is mixed with the urine, in which it floats in the form of viscid flakes. In all these cases the mucus has been found slightly alkaline, except that of the digestive tube, which remains acid. This alkaline property is owing to the presence of a small quantity of soda. These copious secretions of thin mucus often prove critical, in relieving attacks of congestion or slight inflammation.

In more acute inflammation there is excreted in the beginning a very acrid sero-mucous fluid, which excoriates the lips in coryza, the cheeks in ophthalmia, the anus in diarrhœa, and the internal surface of the thighs in leucorrhœa; this thin acrid mucus is sometimes streaked with blood, as in bronchitis and dysentery. It differs from the mucus of congestion or mild inflammation by coagulating in boiling water and containing albumen; its acridity is due to the presence of alkali (soda); the quantity of albumen is sometimes so considerable that it floats in the thinner part of the fluid in white lumps, differing in no respect from the albumen contained in the serum of the blood, but that there is mucus incorporated with it. At this period of the inflammation there is sometimes an exudation of fibrine as well as of albumen, and this leads to the formation of the false membranes frequently found in the larynx, the trachea, or in some portions of the alimentary canal. As the inflammation advances, the secretion lessens in quantity, and it becomes completely suppressed when the inflammation has reached its height; there is only then exhaled a very small quantity of a thin viscid fluid, frequently more or less tinged with blood.

When the inflammation begins to abate, the secretion returns, becomes very copious, and assumes new characters and properties, having a striking analogy with the favourite hypothesis of *coction* of the ancients. In ophthalmia it is effused in considerable quantities on the surface of the conjunctiva under the appearance of a yellow opaque viscid fluid, distinctly globular, and still a little acrid; it presents nearly the same characters in coryza. In acute bronchitis the expectoration, which consisted first of a thin mucus mixed with some albumen, now assumes the appearance of opaque, yellow, conglomerated masses, surrounded with some mucus, and constituting well-formed sputa, such as was termed by the ancients *well concocted*. In diarrhœa there is a greyish, yellow, viscid fluid, containing small portions of coagulated albumen; in blenorrhagia a profuse secretion of a viscid opaque fluid of a yellow colour, inclining sometimes to green. All these secretions, when analyzed, separate into two principal fluids; one, of a milky colour and transparent, floats on the surface of water, or is suspended in it in small flakes; the other, which is of a greyish yellow, and presents all the characters of genuine pus, sinks to the bottom of the vessel. Puriform mucus floats on the surface of water, if the mucus preponderates; but if the pus be in larger quantity, it sinks to the bottom. In very severe inflammation the secretion consists of very little mucus, but almost entirely of pus, and the viscidity of the expectoration diminishes with the increase of the latter.

In chronic inflammations of mucous membranes, and especially in old catarrhs, if the inflammation is very moderate, the secretion is often purely mucous and not purulent, it separates into two parts, one transparent, slightly viscid, and chiefly serous; the other more opaque, greyish, flaky, grumous, and consisting of pure mucus: it is sometimes streaked with black from the secretion of the bronchial glands. If an acute inflammation supervenes on the chronic, the expectoration becomes more thin, abundant, acrid, or frequently purulent, and does not resume its usual qualities until the inflammation abates. These exacerbations of old catarrhs are generally attended with great irritation. Profuse mucous or sero-mucous secretions of long standing must not be supposed always to indicate chronic inflammation, as they sometimes occur spontaneously by a mere increased activity of secretion. When, however, the secretion is both purulent and mucous, it is always a sure sign of the presence of inflammation either acute or chronic: profuse purulo-mucous discharges of this description occur sometimes in coryza, bronchitis, and colliquative diarrhœa, and are attended with considerable debility.

The alterations of the bronchial secretions in pneumonia are also striking and important. In the first stage of inflammation there is expectorated a white viscid frothy fluid, containing a good deal of saliva; it gradually acquires a yellow and then a green tint; its viscidity increases so much that it separates into two parts, the one a thin frothy fluid, the other a thick viscid ropy substance, which sinks and adheres to the vessel. About the third or fourth day the expectoration is often slightly tinged with blood, either uniformly or in streaks, and of a bright red or iron dusky colour; it has generally a saltish taste; the blood is, however, closely incorporated with the sputa, and not free, as in hemoptysis. The expectoration at this stage is found to contain mucus, albumen, and a certain proportion of fibrine, united with some of the colouring matter of the blood; it is the combination of albumen and fibrine with the mucus that renders the expectoration so plastic, adhesive, and ropy.

In the second stage of pneumonia, or that of red hepatization, the expectoration presents the same characters, only that the thinner fluid becomes also tinged with blood, which gives the whole expectoration a dirty pale-red colour; there is, however, a considerable decrease in its quantity. In partial and interlobular pneumonia the expectoration may continue purely catarrhal, or be only very slightly coloured.

In the third stage, or that of the grey hepatization, the secretions being suspended, there is for some time little or no expectoration; but as soon as the inflammation, having reached its height, begins to decrease, the expectoration returns. From being viscid, adhesive, and sanguineous, as described in the second stage, it becomes yellow, opaque, less tenacious, and also less tinged with blood; it sinks in water, and possesses all the characteristics of pus. As the resolution advances, the expectoration gradually becomes less purulent, and assumes again the plastic, viscid, sanguineous appearances of the second stage of inflammation; it then passes from this state to that of pure mucus, until, on the complete restoration of the pulmonary function, it finally disappears.

The transition of the tenacious bloody expectoration into purulent can be very distinctly traced by dissection in the bronchial tubes of an inflamed lung. If the inflammation be arrested in the second stage by active treatment, the expectoration, instead of assuming a purulent character, loses its viscidity, becomes more sanguineous and very frothy: this change is favourable, as it indicates a more free admission of the air into the inflamed pulmonary texture, and an exudation of blood on the surface of the mucous membrane—a kind of bronchial hemorrhage which tends to relieve the pulmonary congestion and inflammation. It is evident, therefore, that the formation of pus requires that the inflammation should have attained a certain height, and the blood have been submitted to a certain elaboration; this corresponds exactly with the notion of *coction* entertained by the ancients, which, however ridiculed by some, was founded on a correct observation of nature.

In chronic pneumonia the expectoration consists of thin transparent mucous fluid, and of a yellow purulent matter, which sinks to the bottom. In chronic catarrh and bronchitis we have already seen that the expectoration is sometimes purulent, but consists in other instances of mucus, more or less viscid or diluted. Purulent sputæ always sink in water; mucous sputæ sink in water when very thick and viscid, but float on the surface when thin and flaky, and pure pus floats on water when mixed with a large proportion of mucus.

It has thus been seen that in the inflammation of mucous membranes, the component parts of the blood undergo distinct changes, by which all the morbid phenomena can be explained as satisfactorily as in phlegmon. The serous portion of the blood, which has acquired increased coagulability, is exhaled with some of the fibrine, and frequently tinged with the colouring matter; the albumen of the serum, and the fibrine, supply the materials for the secretion of pus; and all these fluids are mixed in various proportions with the natural secretions of the membrane, which have themselves undergone certain changes both in quantity and quality.

The secretions of the skin experience corresponding alterations in inflammation. The skin, when inflamed, secretes at first a serous fluid analogous to the serum of the blood, but containing an increased quantity of albumen, which gives it a gelatinous appearance; as the inflammation advances, a portion of fibrine is added, increasing the tenacity of the secretion, and forming sometimes a plastic membrane. These changes may be observed in the bullæ arising from blisters, sinapisms, burns, &c. When the inflammation has reached its acme, the gelatinous layer becomes more dense and friable, acquiring a yellow opaque colour, and all the properties of pus. In chronic erythematic affections the pus is sometimes greenish, tinged or mixed with pure blood. The secretions of the inflamed sebaceous glands are sometimes incorporated with the sero-albuminous or purulent fluid, giving it a peculiar fetid odour, varying in different parts of the body. It is by the concretion of these various fluids that the scales and crusts of cutaneous diseases are formed, as observed in herpes, tinea, psoriasis, &c., and it is also from the sebaceous matter that these crusts derive their peculiar odour.

The changes which the blood undergoes in inflammation, and its mode of conversion into pus, are the same in all textures; the intimate composition of the pus is also identical in all, presenting only such modifications as necessarily arise from the character and degree of intensity of the inflammation, and from the intermixture with other fluids. As the composition of the pus and its various modifications will be more fully considered in the section *Suppuration*, we shall only remark that its globular appearance, and its being composed chiefly of albumen and fibrine, are striking proofs, in addition to those already advanced, of its being derived immediately from the blood.

The exudation, in the inflamed part, of coagulated blood or lymph, and of other materials more or less concrete, proves sometimes so completely critical, that the inflammation subsides, leaving the swelling behind it. The inflammatory products may then remain in the part for a considerable time without undergoing any change, constituting various forms of induration and infiltration. These swellings may at a later period terminate by absorption or suppuration, or else take on some form of specific and unhealthy inflammation, such as the cancerous, syphilitic, scrofulous, &c. The dispersion of the inflammatory deposits without suppuration is partly accomplished by the impetus of the current of the blood gradually removing the cause of obstruction from the clogged vessels, and partly by interstitial absorption, as already stated in describing the phenomena of resolution.

It is important to remark that, besides the tumefaction resulting from the deposit of *morbid* products, inflammation, when much prolonged or often repeated, causes sometimes an enlargement of parts, by exciting an exuberant action of the nutritive powers, and a consequent excessive nourishment termed *hypertrophy;* there is in this case merely an increased activity of the healthy functions, and a preternatural enlargement of the healthy structure, without the occurrence of any morbid process, or the production of morbid deposits. Hypertrophy is more frequently induced by chronic than by acute inflammation. On the other hand, one of the frequent effects of inflammation, as already stated, is to interrupt the healthy functions of a part; it may cause in this manner a waste of parts from deficient nourishment, and reduce them to a state of *atrophy;* this is more generally a consequence of acute inflammation. These opposite results of inflammation are sometimes observed in parts composed of different structures; an exuberant nourishment of one tissue is generally attended with a deficient nourishment of the other tissues of the same organ. We sometimes see a considerable thickening of the investing membrane of an organ, and a wasting of the substance of the organ itself.

The nutritive powers may not only deviate from the healthy standard by being increased or diminished, but are sometimes also perverted; and this leads to *transformations* of texture. One tissue may thus be changed by a mere aberration of nutrition into a structure corresponding exactly with some of the tissues already in existence in the body, such as bone or cartilage; and these transformations are called *analogous.* But parts that have been long exposed to chronic inflammation frequently acquire a new structure in consequence of a vitiated nutrition, totally different from any in the healthy body; and these transformations are called *non-analogous.* They give origin to a variety of tumours, simple or compound, hard or soft, benign or of a malignant nature. Acute inflammation generally lessens the cohesion of tissues, and often reduces them to a remarkably pulpy state, by a peculiar process termed *softening.* Chronic inflammation, on the other hand, has a greater tendency to cause parts to become indurated.—There are many exceptions, however, to these rules. Softening and induration are sometimes combined in the different textures of the same organ; but we must refer to the articles INDURATION, SOFTENING, HYPERTROPHY, ATROPHY, for fuller details of these important changes.

When the sensibility and vascular action of a part are so completely destroyed that all vital motion ceases, the dead animal tissues are soon affected with putrefaction, and this constitutes what is termed mortification. When this occurs as the direct effect of inflammation, it is to be attributed either to its excessive violence causing the rupture of a great many vessels and a considerable extravasation of blood, or to the nature of the exciting cause, or to some obstruction of the circulation. We shall not, however, enlarge here upon this and some other effects of inflammation, such as ulceration, effusion, &c., as our only object in this section is to describe those morbid changes which are best calculated to illustrate the theory of inflammation, so as to enable us to define it accurately from all other morbid actions. We must, therefore, refer the reader for further details to the articles MORTIFICATION, ULCERATION, &c.

Although the preceding changes of structure are frequently the consequence of inflammation, it is necessary to remember that they may occur without any inflammation: the preternatural growth of a part presupposes some increased action of its vessels, but this may take place within the limits of healthy action, and the increase of growth does not at all require that it should be carried to such an extent as to become morbid. It is obvious that atrophy is more likely to be the effect of deficient than of increased action; and both induration and softening are frequently seen to take place under the influence of debility rather than of irritation. A perverted state of the nutritive functions will sufficiently account for all transformations of texture, without the necessity of admitting any increase of action; when they are attended with inflammation, this is much more generally to be considered as an ultimate effect of the irritation they have excited in the surrounding parts, than as an exciting cause; there is, however, no doubt that a state of long-continued irritation is one of the most powerful predisposing causes of these changes of structure.

It is important also to observe that many of the other common effects of inflammation sometimes occur without any inflammatory action: that increased secretions, effusions, hemorrhages, adhesions, suppuration, ulceration, and mortification may be the result of a state even opposite to inflammation, is a fact fully established by numerous pathological observations. There are numerous examples of large adhesions in the pleura in persons who had never experienced inflammation of the thoracic organs. Ulceration occasionally occurs in the skin and in the mucous membranes of the alimentary canal and of the throat, without any perceptible inflammation, and when the parts, on the contrary, are quite pale: this frequently happens also in scorbutus. Collections of pus are sometimes found in parts which do not exhibit the least trace of inflammation. Cases of this description, however, are of rare occurrence, and may be considered as exceptions to the general rule. The mortifications of the extremities arising from ossification of the arteries is an example of its occurrence independently of inflammation; and we have occasionally seen instances of the same kind in gangrene of the lungs.

After inflammation and its consequences have been completely removed, the vessels of the part frequently remain weak, relaxed, and irritable; and greatly predisposed, therefore, to a return of the inflammatory action.

Besides the local effects resulting from the application of stimulants to a circumscribed part of the living body, of which we have given an account, they sometimes also excite perturbations in all the functions of the animal economy; this is illustrated by the following experiments, first performed by Kaltenbrunner, and which we have repeated. When a stimulant is applied to the web of the foot of a frog, in the course of a few hours all the symptoms of congestion, such as quickened circulation, increased redness, and slight tumefaction, are not only observed in the part first subjected to the irritation, but nearly to an equal extent also in the web of the other extremity. The irritation has, therefore, spread by sympathy to the whole circulating system, producing an increased redness and coagulability in the entire mass of blood, an increased activity and turgescence of all the vessels, analogous to that observed in the original point of irritation. In fact, a species of general congestion has taken place, constituting fever; this sympathetic fever subsides with the local congestion. If a very acrid and poisonous stimulant, such as a solution of muriate of mercury, be used, the following remarkable results occur:—signs of severe pain; great acceleration of the circulation in the webs of both feet; the globules of the blood, instead of a vivid red, assume a dark brownish colour, and the blood shows a tendency to decomposition; the texture of the webs is tumefied, but rather pale; the skin of the whole body is pallid and covered with a thin mucus; after some time the vessels become less turgid; they contain but a small column of blood and are relaxed, their contractions continuing rapid but feeble. Small ulcers appear on different parts of the body, and the animal finally dies. [In repeating these experiments, however, we have not been able to distinguish the ulcers alluded to.] In this instance we first see a local inflammation followed by sympathetic fever, and next the fever itself becoming the cause of secondary inflammation in various other parts of the body. The essential characters of fever are, therefore, increased quickness of the circulation, alterations in the quality and quantity of the blood, general turgescence of the blood-vessels, and, as aptly remarked by Kaltenbrunner, a species of inflammatory erethism. In secondary fever the local effects of stimulants are propagated to the whole vascular system, whilst primary fever itself may become the exciting cause of local inflammation.

The character of the fever may vary according to the previous state of the constitution, and the activity and nature of the stimulant. If a powerful stimulus be applied to a constitution in which there is a redundancy of rich blood and great activity in all the functions of life, the reaction will be strong, and the fever of a highly inflammatory nature. If, on the contrary, the mass of the blood be deficient in fibrine and red matter, and the vital powers low and little excitable, there will be less tendency to symptomatic fever. It has been observed that the lower animals are less subject to fever than the higher, but sink more rapidly under it. If there be a predominance of the nervous system, a great mobility of fibre and spare habit of body, the fever will be characterized rather by nervous irritability than great vascular action. If the irritating cause be of such a nature as to act chiefly on the nervous system, by first exciting and then depressing it, as is the case with various animal and other poisons, the fever will also assume an essentially nervous character. If a vitiated state of the blood and fluids be combined with an exhausted and irritable nervous power, we shall have the most formidable and pernicious kind of fever, characterized by an alarming combination of nervous and inflammatory symptoms: this is still more likely to occur if the exciting cause itself be of a depressing nature, such as animal and other poisons, the putrid matter of dissection, over-exertion of mind; depressing passions, &c. Finally, the exciting cause may operate on constitutions characterized by a specific morbid diathesis, such as the scrofulous, rheumatic, gouty, cancerous, &c.; in which cases the fever assumes a variety of well-defined modifications; all these varieties of constitutional fever will be more particularly considered in their proper place. (See *Constitutional Symptoms.*)

General Inflammatory Appearances of the Blood.—Besides the various alterations in the composition of the blood that have been described as occurring in local inflammation, the qualities of the entire mass of the blood are liable also to be affected in certain states of the constitution, which either predispose to, or are consequent upon local inflammation; there is, it may be said, a general inflammatory condition of all the fluids of the animal economy, and this is especially true with regard to the blood, the inflammatory characters of which we shall proceed to describe.

When blood is drawn from an individual affected with an inflammatory disease sufficiently severe to disturb the constitution, the nature and appearance of the coagulum differ very materially from those of healthy blood; it contains a larger proportion of fibrine than healthy blood, and the fibrine at the top of the coagulum forms a layer of a yellowish white or slightly greenish colour, varying in thickness from less than a line to one or two inches; this layer has received the name of *size*, *buff*, or *buffy coat;* the surface of the coagulum is also frequently contracted, puckered up at the edges, and concave in the centre; the blood is then said to be *cupped.*

According to the researches of Hewson, Dowler, (On the products of acute inflammation, by M. Dowler, Med. Chir. Trans., vol. xii.), Gendrin (Histoire Anatomique des Inflammations, vol. ii.) and others, the buffy coat consists of pure fibrine, deprived of the colouring matter, and mixed with a certain quantity of serum, which is found to contain much more albumen than the serum of the rest of the blood. There is a great analogy, therefore, both in appearance and in chemical composition, between the buffy coat of the blood, and the coagulable lymph that constitutes false membranes. Besides the buffed and cupped appearances just described, the coagulum is in general of a greater density than in health, and less easily broken; it is firmly contracted and dry, in consequence of the serum being more completely pressed out of it, and it appears for this reason smaller in proportion to the quantity of serum; it has an ovoid truncated shape, and is frequently found floating in the centre of the vessel on a level with the serum. The cupped appearance, however, and the firmness both of the buffy coat and of the entire coagulum, are usually proportionate to the strength of the patient, and severity of the inflammation, and are also greater in the inflammation of certain textures than of others, such as serous membranes, aponeuroses, tendons, ligaments, and other fibrous tissues. But it should be remembered that there is sometimes considerable firmness of the coagulum without any buff or cupping.

When the buffy coat is soft, the coagulum is less cupped, softer and larger, adheres to the bottom of the vessel, and contains more serum; the layer of buff is also thinner, and there is in reality a larger proportion of serum, although this may not be apparent at first, in consequence of its not being so completely separated from the coagulum: the blood is then sometimes described as being *sizy*. Whenever there is an excess of the serous portion of the blood, the coagulum will be found soft.

The serum of inflammatory blood is also proved, by the researches of Drs. Traill and Gendrin, to be altered in quality, and to contain nearly twice as much albumen as in the healthy state. Gendrin has sometimes observed, especially in cases of chronic and suppurative inflammation, a *mucous layer*, either at the bottom of the serum, or suspended in it like a cloud; the buffy coat in these cases was also of a more obscure white, less transparent, and softer.

The following are the appearances presented by the blood under different degrees of inflammation, according to numerous experiments made by Gendrin. (Op. cit. vol. ii. p. 430.)

In cases of very severe inflammation the blood coagulates rapidly. The buffy coat is thick, greatly cupped, firm, and elastic; the coagulum has the form of an oval, truncated at both extremities; it is dense and elastic (containing little serum), and floats on the surface of the serum, to which it bears the proportion, in point of volume, of one to one and a half, and sometimes two. The serum is viscid, colourless, and a little turbid at the bottom, but contains no colouring matter. In some rare cases of extreme inflammation, the proportion of serum is less than that of coagulum; the buff is very thick and dense, the coagulum adheres to the bottom of the vessel, where it is broader than at the top, having the shape of a truncated cone.

In cases of moderate inflammation the buffy coat is not so thick; there is little or no cupping; the coagulum is firm, cylindrical, and floats in a yellowish serum, equal in quantity to twice the volume of the coagulum; there is also a slight layer of colouring matter at the bottom of the vessel.

In sub-acute inflammation the coagulum may be slightly buffed, but more generally presents on its surface a layer of a bright red colour, and one or two lines in thickness; it is dense, slightly ovoid, and floats in the serum, although it sometimes either adheres to the vessel, or sinks to the bottom. The serum is viscid and limpid, but of a reddish colour at the bottom of the vessel, in consequence of the precipitation of some of the colouring matter; the serum equals in quantity at least twice the volume of the coagulum.

There may occur, of course, many modifications in degree between each of the preceding divisions; but this general outline will be sufficient to guide us in estimating the character of the inflammation, as far as we can depend upon the appearances of the blood.

It is important to notice that the blood may present all the inflammatory appearances just described, without the actual existence of any inflammation. Ratier and Belhomme ascertained by numerous experiments, that the blood of individuals in a state of sanguineous plethora was often buffed and cupped; this circumstance affords an additional proof, if any were wanting, that the general state of the blood may become a primary cause either of inflammatory fever or of local inflammation. The same inflammatory appearances are frequently observed also in pregnancy; the constitution of a pregnant woman bearing the closest analogy to the inflammatory diathesis, for the extraordinary increased activity of the circulation in the uterus borders on inflammation, and the general circulation of the mother is in a state approaching to symptomatic fever. The buffy coat has also been found in individuals who were in the habit of being bled, as a measure of precaution, at certain periods of the year.

The buffy coat and cupped-like form have been observed in the arterial blood during inflammation. Dr. Tweedie has seen it on two occasions; one was a case of inflammation of the chest, in which the temporal artery was opened in consequence of failure to procure blood from the veins; the other was a case of cerebral fever, in which blood was also taken from the temporal artery. Gendrin says that, on the only two occasions in which he opened the temporal artery, he observed a thin layer of buff, slightly coloured, on the surface of the blood.

The presence of the buffy coat may generally be considered as a correct indication either of the actual existence of inflammation, or of a strong predisposition to it; and when the obscurity of the other symptoms leaves any doubt respecting the inflammatory nature of a case, a buffed and cupped appearance of the blood will tend greatly to confirm us in the opinion of the disease being inflammatory. The degree of buffiness is not, however, in proportion to the danger of the inflammation; for, as already stated, in the inflammation of fibrous tissues, the blood is in general more intensely buffed and cupped than in that of vital organs. The absence of the buffy coat is not, on the other hand, to be taken as conclusive evidence of the non-existence of inflammation. We have seen that in sub-acute inflammation the buffed and cupped appearances are often wanting, and that they accompany the inflammation of certain tissues more constantly than that of others. In some inflammations of the mucous membranes, for instance, such as bronchitis, the blood frequently exhibits no buffiness or cupping. In weak or phlegmatic subjects also, whose blood is impoverished and whose constitutions are not very susceptible of sympathetic irritation, an important organ may be affected with dangerous inflammation, although the blood exhibits no indication of such a state of disease, and has, on the contrary a dark red, jelly-like, and decomposed appearance. This has been observed in cases in which the inflammation has run rapidly to gangrene, or when the fever was of a typhoid character. It has also sometimes occurred in these cases, that when the typhoid symptoms have subsided, and the fever has assumed a more acute character, the blood has then become buffy. Whenever, therefore, there are other well-marked symptoms of inflammation, we are not to attach much weight to the fact of the blood not exhibiting the usual inflammatory appearances.

The immediate cause of the formation of the buffy coat is obviously the circumstance of the colouring matter of the blood beginning to subside before the coagulation is complete, so that the upper part of the coagulum loses its redness. There have been numerous speculations respecting the *remote* cause of the buffiness, none of which, however, can be considered as satisfactory. Hewson, Dowler, and some others, thought that the fibrine of inflamed blood became lighter; the latter states that he found the fibrine of the buffy coat to contain a larger proportion of serum, which, by diminishing its viscidity, facilitated the precipitation of the red matter. Hunter took an opposite view of the subject, conceiving that the red matter was squeezed out by the firmer coagulation of the fibrine: this is probably in part correct, as we find the coagulum of inflamed blood much firmer than in its healthy state. Hewson and other writers have also affirmed that inflamed blood coagulates more slowly than healthy blood, and that more time is thus allowed for the subsidence of the red particles. This opinion, however, is controverted by Drs. Davy and Gendrin; the latter maintains, as the result of many experiments, that the coagulation of inflamed blood commences sooner, and is completed more quickly than that of healthy blood. That the slow coagulation of the blood is not sufficient to account for the formation of the buffy coat is clearly proved, moreover, by some experiments related by Dr. Stokes, in his Pathological Observations. He made twenty-seven experiments, in fifteen of which a buffy coat was formed, and in the remainder it was wanting. No coagulation took place in three of the latter class of cases, in less than from twenty to forty minutes, and in four there was no coagulation for eight minutes; there was, therefore, ample time for the red particles to have separated from the fibrine; while in twelve out of the fifteen, in which there appeared a buffy coat, coagulation took place in five minutes, and was only delayed for fourteen minutes in the three others.

Although the comparatively slower coagulation of inflamed than of healthy blood cannot be admitted as the cause of its buffy appearance, it is nevertheless certain that every circumstance favourable to an *unusually rapid* coagulation of the blood has the effect of preventing altogether the formation of a buffy coat. These circumstances are principally the following: a narrow opening of the vein, so that the blood trickles down slowly in a small stream; being thus exposed to the cooling influence of the air, it coagulates almost instantly on reaching the vessel, so that there is necessarily no time for the separation of any of its constituent parts. We may sometimes account in this manner for the first cup not exhibiting any buffiness, while, if the blood is made to flow afterwards more freely, the buff may form in the second cup, in consequence of its coagulating more slowly. The formation of the buffy coat may also be prevented or very much lessened by the blood being received in a flat vessel, and especially if cold; for by warming the same vessel so as to delay the coagulation, the buff has made its appearance. It is likewise prevented by letting the blood fall into the vessel from a height of three or four feet, or by keeping the blood for some time in a state of agitation, or by adding a solution of caustic potash.

The formation of the buff is, on the contrary, favoured by making the blood flow from the vein in a full stream, and by receiving it in a deep and narrow vessel. A narrow vessel is also the most favourable to the blood assuming the cupped appearance, which it very seldom does in broad and shallow vessels. Some have advanced that the mere acceleration of the circulation was sufficient to impart to the blood its inflammatory characters; but this is denied by others, and Sir Charles Scudamore says that he has never observed any buff in cases of simple fever, or after violent exercise. (Elliotson's Lectures, Med. Gaz. Dec. 3, 1831.)

It is evident, therefore, that although the buffiness and cupped-like form peculiar to inflamed blood may be influenced in a certain degree by the various accidental circumstances just mentioned, these are wholly insufficient to account for this remarkable property, and that it must depend on some other cause with which we are unacquainted. The following remarkable facts would tend, however, to show that this property is immediately connected with some peculiar influence exercised by the vital powers of the system over the mass of the blood. The first cup of blood is often buffy, when the second is much less so, and the last one not at all. Now bleeding is frequently attended with an immediate diminution of the violence of the inflammatory symptoms, even while the blood is flowing; and the rapid change in the appearance of the blood may therefore be justly attributed to the amendment in the state of the patient. If at the end of some hours the inflammatory symptoms increase, and blood be again drawn, it will be found to have re-assumed the buffy appearance. Gendrin has observed on several occasions, that if blood was taken immediately after recovery induced by syncope, it not only had lost its inflammatory character, but that the clot was much softer; and the effect of syncope in rapidly subduing the inflammatory diathesis is well known. We have already stated that the fibrine is more abundant in inflamed than in healthy blood; it has been found, moreover, that the quantity of fibrine varies with the buffy appearance in the different cups, the blood of the first cup containing more fibrine than that of the second, so that the relief afforded by the bleeding is attended also with an immediate change in the proportions of the constituent parts of the blood.

In some diseases of debility in which the blood and other fluids are greatly vitiated, the blood is often extremely deficient in colouring matter, and the coagulum appears of a dirty yellow or greenish colour. This must not be mistaken for the buffiness of inflammation, from which it will easily be distinguished, by the great softness of the coagulum, turbidness of the serum, and general dissolved appearance of the blood.

[The state of the blood in inflammation has been long attended to, so far as regards the buffy coat, and the shape and character of the crassamentum. The causes of the buffy coat in inflamed blood are presumed to be its slow coagulation, and the increased quantity of fibrin. We can thus understand, that in anæmia, in which the proportion of the red globules to the fibrin is diminished, the buffy coat may exist; and it is not uncommonly seen in chlorotic cases. The cupped form of inflammatory blood is owing to inequality of contraction. The upper surface being freer from intervening red particles contracts more powerfully than the under, and a concavity of the upper surface is the consequence. When, however, the contraction is weaker, the weight of the subjacent red clot, which forms a part of the same mass with the upper colourless portion, weighs this down, and keeps it in a horizontal position. (B. Babington, art. BLOOD, MORBID CONDITIONS OF THE, in *Cyclop. of Anat. and Physiol.* i. 415.)

The condition of the blood, which gives occasion to the buffy coat, when it occurs in inflammatory diseases, has been considered by M. Piorry (*Traité de Diagnostique*, &c., § 781, Bruxelles, 1838) an inflammatory one of the fluid itself, and has received the name *Hémite.* Positive hæmatological experiments have shown, that inflammatory blood contains an increase of its fibrinous element. The experiments of various observers have been detailed elsewhere. (*Practice of Medicine*, 2d edit. ii. 534, Philad. 1844.) It will be necessary here to refer only to the recent investigations of MM. Andral and Gavarret. (*Archiv. Général.* série 3, tom. viii., p. 501; and Andral, *Hématologie Pathologique*, Paris, 1843; or Amer. Translation, Philad. 1844.) In another article, (BLOOD, MORBID STATES OF THE,) it is stated by the writer, that healthy blood consists, on the average, in 1000 parts,—of fibrin, 3; red corpuscles, 127; solid matter of serum, 80; and water, 790;—the proportion of fibrin probably varying, within the limits of health, from 2½ to 3½ in the thousand. In acute inflammatory affections, M. Andral invariably found an increase in the proportion of fibrin, the increase being proportional to the intensity of the inflammation, and the degree of symptomatic fever accompanying it; and he affirms, that if we find more than five parts of fibrin in 1000, in the course of any disease, we may assert positively, that some local inflammation exists. The average augmentation of fibrin in inflammation he estimates at 7; the lowest at 5; and the maximum at 10½. Pneumonia and acute rheumatism are the only diseases in which he has found the proportion of fibrin rise as high as 10. M. Andral hence approves of Meckel's definition of inflammation—"congestion with tendency to new production"—the new production being, according to M. Andral, an excess in the quantity of fibrin. He found, however, considerable difference in the increase of fibrin according to the seat of the inflammation. In inflammation of the cellular tissue, it did not exceed 5; in pneumonia, it rose occasionally to 10 and more. In inflammations of the mucous membranes, when slight, and unaccompanied by fever, it remained in the usual quantity; but when they attained a certain degree of intensity, and were accompanied by febrile reaction, the fibrin invariably rose in amount. In inflammation of the serous membranes, the increase was marked; and in acute rheumatism it rose as high as in pneumonia. The increase in the proportion of fibrin appears in the blood from the time the inflammation commences. In no case was it perceived before the modification of the solid that characterizes the phlegmasia was present. He properly, however, considers the question yet unsettled as to which of the two phenomena is primary, or whether they do not arise simultaneously. In the case of a burn, the blood clearly becomes affected secondarily, and analogy might lead to the belief, that the same may be the case with other inflammations.

Dr. C. J. B. Williams (*Principles of Medicine*, Amer. edit., by Dr. Clymer, p. 227, Philad. 1844) thinks it is pretty clear, that the increase of fibrin, and its more contractile and separating quality, originate in the vessels of the inflamed part, and must be regarded as an augmentation of the vital process of nutrition developed by inflammation.

If oleaginous or finely-powdered substances be injected into the blood-vessels, they may circulate freely until they reach the extreme vessels; but there they become the source of obstruction and consequent inflammation. Viscidity of the blood may likewise arise spontaneously from disease, and in all such cases some serious lesion of the lungs has to be apprehended.

On the other hand, experiments have shown, that if blood be deprived of its fibrin, and be injected into the vessels, death speedily results; and in such case, the blood has been found to have become so utterly unfit for circulation in the capillary vessels, that it was extravasated into the various tissues, and especially into the parenchyma of the lung. If the fibrin of the blood be removed in small portions, local lesions are induced, the origin of which cannot be mistaken. (Magendie, *Lectures on the Blood*, Amer. edit., Philad. 1839.) It would appear, consequently, that whenever the blood becomes much thinner than in health, it ceases to be adapted for the vessels in which it circulates, and transudation takes place through their parietes. In this mode—as the writer has repeatedly remarked—bleeding in many cases of hemorrhage proves detrimental, especially if watery fluid be freely allowed at the same time.]

Uses of Inflammation.—Inflammation may generally be considered as a salutary process, instituted by the powers of the constitution, or the *vis medicatrix naturæ*, for the purpose of preventing, repairing, or removing the consequences of injury and disease; but, like all other salutary efforts of the system, it not unfrequently becomes a source of serious injury, and leads to fatal results, in consequence either of its excessive violence, or of the importance of the part affected.

The salutary effects of inflammation in *preventing* more serious disease are well illustrated by the process of adhesion. When an opening is made in any of the hollow viscera, either by ulceration or violence, the escape of their contents into the surrounding cavities is likely to prove fatal by exciting violent and very extensive inflammation. This, however, is frequently prevented by a slight inflammation set up spontane ously on the outside of the organs, and near the edge of the ulcer or wound; coagulable lymph is effused, and firm adhesions are thus contracted between the opening and the surrounding parts. Adhesive inflammation is often useful in preventing the spreading of disease, as, for instance, of suppuration or ulceration. Both adhesive and ulcerative inflammation assist materially in the removal of foreign substances or collections of matter, which are deeply seated; thus, in cases of hepatic abscess, there are sometimes firm adhesions first contracted between the liver and the large intestine, or the stomach, and then a passage is opened for the pus, by a process of ulceration, into either of these organs, and its escape into the cavity of the abdomen, which would inevitably prove fatal, is thus effectually prevented. A similar process attends the pointing of all abscesses of internal organs towards the parietes of the cavities in which they are contained, and the passage also of foreign substances through important parts of the body.

The advantages of inflammation in *repairing* the effects of injury or disease are illustrated by the reunion of divided parts, and the restoration or reproduction of some which have been partially destroyed, as is the case with bone, skin, cellular membranes, and vessels; there are structures, however, such as the nervous, muscular, and fibrous, which are not susceptible of being reproduced.

When the consequences of injury or disease are to be *removed*, this is effected either by suppuration, ulceration, or increased secretions. When a part of the body has become useless and injurious in consequence of mortification, and when the mortification has a tendency to spread, this is prevented, and the separation of the living from the dead parts effected by a circle of inflammation being excited at their point of contact, which is followed by a gradual process of ulceration, whereby the dead parts are completely cast off.

When, after severe injuries, parts have been so much lacerated and contused that reparation becomes impossible, they are removed by suppurative inflammation. Suppuration is also sometimes of use in the removal of noxious substances and of foreign bodies; this may likewise be effected by increased secretions, or by the effusion of lymph, which afford relief, moreover, by sheathing and protecting the parts from the action of the irritating cause.

Inflammation is sometimes excited spontaneously in various parts of the animal economy, independently of any external cause, for the purpose of getting rid of some noxious or infectious matter which irritates, oppresses, or otherwise disturbs the operations of life; as is exemplified in the exanthemata, in several forms of fever, &c. We see, therefore, that various modes of inflammation are excited, according to the particular object that is to be obtained.

It is evident from the preceding considerations that inflammation is the most frequent of all diseases; it may exist singly, but is often combined with other diseases. When excited for a beneficial purpose, it is always susceptible of assuming a dangerous degree of violence, and this often depends on the state of the constitution. It frequently, however, occurs as a morbid process, not intended to answer any salutary end; and when it affects certain parts, such as vital organs, it is the most dangerous of all diseases.

Congestions.—The morbid phenomena of the second stage of the inflammatory process, which we have described under the name of active congestion, occur in a variety of important diseases which run their course without passing into inflammation, for which, however, they have not unfrequently been mistaken. Some melancholy instances of the injury done by the adoption of a violent course of treatment in congestive affections, in consequence of their having been erroneously considered as inflammatory, have come under our observation. We think it, therefore, desirable to devote a separate section to the consideration of congestive diseases.

The important distinction between inflammation and congestion was clearly defined by the celebrated Laennec in his admirable discourses on the practice of physic, delivered at the *Collège de France*, in which he devoted several lectures to the consideration of congestive affections. This distinction has also been kept prominently in view by Andral in his excellent Pathological Anatomy, and especially in the section *hyperæmia*, to which we have been indebted for material assistance in this division of our subject.

Between the slightest increase of vascular action and that which constitutes decided inflammation, there are many intermediate degrees. Some of these are so slight and momentary that they do not interrupt the healthy actions of the part, and may be considered as physiological; such as the flushing of the cheek produced by moral emotions, &c. But in many diseases characterized by disturbance of the functions of nutrition, secretion, or innervation, there is a state of congestion more or less active, which is truly pathological. A congested state of the liver, lungs, or any of the secreting surfaces, may be attended either with a suspension or excessive flow of their secretions. Congestion at the origin of the nerves, in the brain or spinal marrow, is frequently the cause of a variety of nervous affections; it may also be induced by long-continued nervous irritation of the brain itself. A sudden congestion in some organs may be the cause of instantaneous death, as in sanguineous apoplexy and spontaneous hemorrhages. Many of these diseases, although attended with very serious disturbance of the general health and considerable suffering, leave behind them no trace whatever of any change of structure, or else appearances only of an increase of vascularity, quite inadequate to account for the severity of the symptoms. It is evident, therefore, that there is a state of increased activity of the circulation, not amounting to inflammation, which may become an extensive source of disease; and we think this state may be appropriately distinguished from true inflammation by the name of *congestive irritation*. The study of this morbid condition is of considerable importance; for besides constituting of itself an important class of diseases chiefly *functional*, it may lead to inflammation, and lay a foundation for the development of many *organic* diseases; so that it may almost be laid down as an axiom in medicine, that diseases of function always precede diseases of structure. It should be remembered, however, that these morbid actions are closely linked together, passing by imperceptible gradations into each other; and that it is often as difficult to draw the exact line of demarcation between the healthy and pathological species of congestion, as between the latter and inflammation.

Congestive irritation may be more particularly limited to the arteries, the veins, or the lymphatics. Arterial congestion occurs most frequently in children, and venous congestion in old people. The scrofulous diathesis is peculiarly subject to congestive irritation of the vessels and glands of the lymphatic system. The vessels carrying only the colourless or serous portions of the blood, and those destined to the function of secretion, may be affected with congestive irritation as well as the vessels containing red blood, as is seen in sudden attacks of diarrhœa, cholera, &c. Congestions, however, may also occur without previous irritation, depending on debility of the vessels, mechanical obstructions to the circulation, or some alteration in the qualities of the blood. Congestions may, therefore, be divided into active, passive, and serous.

Active congestions.—These may be the effect, as already stated, of a primary irritation either of the nervous or vascular system, or of both conjointly; they are characterized by various degrees of increased activity of the circulation; injection and enlargement of the minute vessels; slight tumefaction, and in certain textures, redness, pain, and heat. Or when the congestion is very considerable, there is a languid oppressed circulation from over-distension. Active congestions differ, however, from inflammation, as already stated, by the circumstance of there being no rupture of the vessels or extravasation of blood, no exudation of blood, coagulable lymph, formation of new products, or decided change of structure. Almost every part of the body may be affected with active congestion, but it is of most frequent occurrence in organs of a highly vascular structure, or having numerous direct communications with the heart and large vessels. We shall briefly notice the effects of active congestion in some of the principal organs.

In the brain, which it is obvious must be greatly predisposed to active congestion, it may occasion severe headach, delirium, drowsiness, vertigo, convulsive and other nervous affections; and it may lead to apoplexy, meningitis, or encephalitis: these symptoms are the result either of the stimulus of an excessive quantity of blood, or of its pressure on the cerebral mass and origin of the nerves. The cause of the congestion may not be seated in the brain, but depend on its morbid sympathy with some other organ, or on the general state of the circulation.

The lungs are perhaps more liable than any other organ to be affected with active congestion, either of their parenchyma or mucous membrane. This is a frequent source of embarrassed breathing, and of a variety of other symptoms of pulmonic irritation; as, for instance, the dyspnœa attending asthma, chronic suffocative catarrh, and diseases of the heart. There are many other circumstances capable of causing a sudden determination of blood to the lungs; it sometimes happens that while portions of the lung are engaged in chronic inflammation, the rest of the organ is in a state of congestive irritation. Active congestion is one of the frequent causes of hemoptysis.

Congestion of the heart and adjoining large vessels is of frequent occurrence; any obstruction to the circulation from organic disease in the lungs, brain, or large vessels in the neighbourhood of the heart, or any circumstance repelling the blood from the surface and extremities of the body towards the centre, must necessarily cause it to accumulate in the heart; and this may induce either symptoms of quickened and irregular, or slow and oppressed action. Organic disease of the heart is also a frequent consequence of a long-continued state of congestion.

There are many hepatic affections depending on a state of congestion of the liver, not amounting to inflammation. The great vascularity of this organ, and the peculiarities of its vascular system, consisting of a large proportion of veins in which the blood circulates slowly, greatly predispose it to congestion. The majority of hepatic diseases in this climate are functional, the liver not being so subject to active inflammation as in tropical regions. A congested state of the liver sometimes causes sudden jaundice by obstructing the biliary canals; at others it gives rise to an excessive flow of bile, which is ejected by vomiting or diarrhœa, as in cholera; in some cases it has been followed by ascites, an unusual quantity of blood being thrown into the vessels of the peritoneum, in consequence of the obstruction of the branches of the vena portæ. Some remarkable cases of this description have fallen under our observation, and they have in general yielded readily to an appropriate treatment.

The great extent of the mucous surface of the alimentary canal, its high vascularity, and numerous sources of irritation, sufficiently account for its being frequently the seat of active congestion. The pathology of these viscera, which was for a long period almost entirely overlooked, has been diligently investigated of late years, and its general importance fully established. The influence of a partial congestion and inflammation of this membrane in many diseases, and especially as the proximate cause of continued fevers, has, however, been much overrated. It is particularly with respect to these organs that some pathologists have frequently described appearances as inflammatory, which belonged only to the increased vascularity of active or passive congestion. We have sometimes seen, whilst on the continent, patches of mere redness and injection found in the stomach or intestines, noted down as decided inflammation by disciples of Broussais.

Continued and intermittent fevers, and some of the exanthemata, are generally attended with congestive irritation of several of the internal organs, which sometimes assumes the character of sub-acute, and more rarely of active inflammation. Various degrees of vascular injection and redness are often found in patches in the stomach and intestinal canal of patients who die of fever. In the yellow and some low forms of fever, characterized by violent and irregular determinations of blood, large portions of the mucous membrane present sometimes a uniform dark injection, and the patients in the last stage of these fevers frequently discharge blood by the mouth and anus. The hemorrhagic affections of the alimentary canal, such as hematemesis, melæna, the hemorrhoidal flux, are usually preceded by some degree of congestive irritation, which seldom amounts to inflammation. In melæna the congestion, however, is in general rather passive than active. There is often an unusual quantity of blood forced into the vessels of the alimentary canal in diseases of the heart and liver, giving its mucous coat a highly injected and uniform red appearance: the same may occur when the last struggles of life are violent and much prolonged, but in these cases the congestion is also frequently passive.

The uterus is always in a state of congestion at the approach of the menstrual period. This organ is peculiarly subject to congestive as well as nervous irritation, which sometimes leads to profuse hemorrhage. The morbid irritations of the uterus exercise a most powerful influence over all the other functions, and especially those of the nervous system. The kidneys are affected with congestive irritation in some cases of hematuria, especially after scarlatina: the only morbid appearance these organs present in diabetes is a dilated and injected state of their blood-vessels. The spleen is frequently found excessively distended with dark blood after continued and intermittent fevers.

We have well-characterized instances of active congestion of the skin in a variety of cutaneous diseases. Erythema and erysipelas may be considered as holding a middle station between active congestion and inflammation, presenting the characters of the former when mild, and of the latter when severe. Petechiæ sometimes depend on congestive irritation, though they seem more generally connected with a passive condition of the vessels. The mucous membrane of the nose, mouth, and pharynx is often affected with active congestion: and there is in some individuals an habitual congested state of the pharynx and tonsils, that greatly predisposes them to reiterated attacks of cynanche. Sudden congestion of the pharynx occurs also sometimes in hysteria. Several diseases of the bones, such as necrosis, extensive caries, spina ventosa, are occasionally attended with great vascular congestion and profuse hemorrhage. This is also the case with cancer, fungus hæmatodes, erectile, and other tumours.

The preceding general, though imperfect, sketch of some of the principal varieties of active congestion is sufficient to show that it is a pathological condition of extremely frequent occurrence, and that it includes a number of most important diseases.

Considerable vigour in the powers of life, a great development and activity of the vascular system, with a large proportion of rich blood, will no doubt strongly predispose to active congestions. They, however, frequently occur also in an opposite state of the constitution—one of great general debility. The irritability of both the nervous and vascular systems being considerably increased by weakness, very slight causes are then sufficient to induce severe local congestions. The nervous sympathy existing between the different organs has a remarkable and important influence in the formation of active congestions; the morbid irritation which attracts the blood to one organ is often transferred through the medium of the nervous system to other organs, and disturbs their functions. The occurrence of any considerable change in the circulation of one organ, either in excess or deficiency, frequently tends also to destroy the balance of the circulation in others, constituting in this manner a species of sanguineous sympathy; we accordingly find that a primary congestion is sometimes followed by secondary congestions in other organs, whilst it sometimes has a contrary effect in depriving other organs of their usual quantity of blood. Thus, in congestions of the mucous membrane of the alimentary canal, the skin may be either hot and red, or pale and cold; the brain either violently congested, or in the opposite condition. The occurrence of these secondary congestions depends of course on the extent of sympathy existing between the several organs, and this accounts for many of the important combinations of symptoms in disease; as, for instance, the cerebral symptoms accompanying active congestions of the stomach and intestinal canal; the occurrence from a similar cause of paroxysms of asthma, or of disordered action of the heart. The morbid irritability of the uterus, either with or without congestion, is a most prolific source of active congestion in either the digestive, the respiratory, the circulating, or the cerebral organs, and gives rise to an endless variety of anomalous and distressing symptoms. A diminution in the usual quantity of blood, and a deficiency in the vitality of one organ, may also become, as before stated, the immediate cause of congestion in others; as, for example, the sudden suppression of the perspiration, or an habitually torpid action of the skin from long-continued exposure to cold and damp; the suppression of the catamenia; of the urinary or alvine excretions; the application of cold and wet to the extremities, &c. If any one organ is in a state of disease, or has previously been so, that organ has the greatest disposition to be affected with either primary or secondary congestion.

When congestion exists in several vital organs at the same time, there is often a combination of most dangerous and alarming symptoms, many of them, however, of a purely nervous character, and leaving no morbid appearances beyond very slight traces of increased vascularity in some of the organs. A secondary congestion has sometimes the effect of aggravating the primary disease, at others it supersedes it; and in some cases there are singular alternations of disease called *metastases*, as is often observed between the brain and the stomach, or the brain and the lungs. These irregular determinations of blood may be traced in a great measure to the influence of the nervous over the vascular system, and especially over the functions of the minute and capillary vessels, for they occur particularly in debilitated subjects, whose nervous system is highly susceptible, and endowed with great mobility: the just balance and harmony of the circulation is easily destroyed under this feeble and unsteady action of the nervous power; points of irritation are excited in various organs from the influence of slight causes, inducing a sudden, unequal, and temporary flow of blood towards these organs, and a consequent train of anomalous symptoms, frequently of a formidable description. It is remarkable how trifling a degree of local irritation and congestion is often sufficient under this state of weakness and irritability to cause violent pain, delirium, convulsions, or syncope; this class of patients, moreover, very frequently exaggerate their symptoms. An incautious perseverance in very active remedies in such cases is only calculated to aggravate their condition, and it is often necessary to combine, in their treatment, moderate local depletion with the administration of tonics, and to depend sometimes altogether on the restoration of the general strength. This important principle did not escape the attention of the great Hunter, for in the treatment of severe ophthalmia, in highly irritable constitutions, he often found bark and a generous diet more successful than depletion and purgatives. It should be observed, however, that long-continued disturbance in the nervous action of an organ has a great tendency to induce active congestion, and lay the foundation of organic disease; and this important consideration should never be overlooked in the regulation of the treatment.

The state of the mass of the blood, both as to quantity and quality, is a very frequent cause of active congestion. There is sometimes a greater quantity of blood formed than is required for the purposes of life, and this creates a state of over-distension of the whole vascular system, a sort of general congestion called *plethora.* There is a tendency in some constitutions to make blood more rapidly and in greater quantity than in others; this is favoured by high living and little exertion either of body or mind. There is also a much greater natural development of the vascular system in some individuals, constituting the sanguineous temperament; and the blood is then generally rich in fibrine and red matter. This excess in the quantity and nutritive quality of the blood keeps the solids in a state of permanent excitement highly favourable to the development of active congestion and inflammation. When this excitement is carried to a considerable extent, it ceases to be healthy; every portion of the animal economy is stimulated into inordinate action; the functions both of the nervous and vascular system become generally disordered; the pulse increases in strength and frequency; the temperature of the body is raised; the secretions are variously modified; and all the symptoms of general fever, without any marked local affection, are developed.

This fever from plethora may be mild and soon subside, or else there may be a strong general reaction, giving rise to a variety of alarming symptoms, and sometimes to an apparent prostration of strength from oppression of the powers of life. When this form of fever terminates in death, the only morbid appearance to be discovered is a certain degree of congestion in the minute vessels of the different organs, without any one being more particularly affected than the rest. It has been remarked by Andral, that since wherever the blood is distributed, derangement of function is found, the first cause of the disease resides indisputably in the blood, the lesion of the solids being only secondary. That cases of fever exactly corresponding with the preceding description do sometimes occur, is a fact as well established by the concurrent testimony of many experienced pathologists, as any in medicine. We have had the opportunity of examining several hundred bodies of persons who have died of fever, and in some of these, although certainly but a small proportion, we have been unable to detect any morbid appearance worth noticing; the assertion, therefore, of Broussais and his followers, that fever is always the effect of a sympathetic irritation of the heart depending on the irritation or inflammation of some other part of the body, and that essential or idiopathic fever has no existence but in the imagination of some pathologists, is directly opposed to general experience. There are few, we believe, who would venture to deny that all the organs are sometimes found perfectly healthy in other acute diseases which have come unexpectedly to a fatal termination; and it may well be asked, why should not the same occur in fever?

A plethoric condition of the system is, however, most generally combined with a great tendency to accumulation of blood and active congestion in the different organs. When the brain is thus affected, a variety of cerebral symptoms, such as have already been described, may manifest themselves, and even a fatal termination be the result, without leaving any other trace of disease than a highly injected state of the vessels. The congestion may more particularly affect the thoracic organs, and occasion distressing symptoms of dyspnœa, cough, palpitations, &c. The digestive and hepatic viscera are frequently the seat of active congestion from plethora, in which case the digestion may be impaired, the secretions increased or vitiated, and indirect debility induced by the oppressed action of the different organs. It is justly observed by Dr. Barlow, in the article CONGESTION OF BLOOD, that this condition of the system has often been mistaken for common dyspepsia, and a more formidable and permanent disease been excited by the adoption of a tonic course of treatment; whereas, if the mass of the blood be diminished, and the vessels unloaded by means of venesection, by remedies tending to increase the secretions, and by abstinence, the oppressed organs soon recover their free action. The kidneys, uterus, and cutaneous surfaces may be similarly affected, and a natural cure sometimes takes place by spontaneous hemorrhage. The ancients were well acquainted with this state of the system, and were by no means in error when they laid it down as an established pathological principle, that many acute and chronic diseases, especially of the digestive, hepatic, and excretory organs, were to be considered as critical efforts of the constitution tending to rid it of various sources of oppression or irritation, and to re-establish the just balance of the functions. The late Mr. Abernethy has accurately pointed out the great importance of attending to this principle in the treatment of surgical diseases, and he is on this account justly entitled to the merit of having introduced a new era in this department of pathology.

A state of great obesity induces sometimes a form of plethora more dangerous, perhaps, than any other in its consequences, and more difficult to obviate. When a great quantity of fat is deposited under the skin and round important viscera, the small vessels become so compressed, that the blood necessarily accumulates in the heart and larger vessels, in which case those organs destitute of fat, such as the lungs and brain, are often oppressed by excessive plethora, and strongly predisposed to active congestion; the action of the heart itself is frequently impeded by the mass of adipose substance surrounding it, and its muscular tissue is even sometimes partly converted into fat: this condition of the system is generally characterized by an extremely embarrassed, slow, and irregular circulation, and great disorder in the functions of the brain, lungs, and heart; in one instance we observed the pulse frequently so low as 28 in a minute, and it never rose to 40.

There may be an habitual excess of blood in one organ, a state of local plethora, whilst the other parts of the body have even less than their natural quantity. This may be the effect of natural conformation. When the thorax is narrow or deformed, the lungs are compressed, and the circulation through them is so impeded, that a slight acceleration of the action of the heart will be sufficient to cause an accumulation of blood in their texture. The same may occur in the brain when the head is small in proportion to the size of the trunk, and especially of the thorax. Large men with a small head and short neck often suffer severely from cephalic affections, especially when the heart is large and its action naturally vigorous; on the other hand a very large head and contracted chest may be attended with the very same result, especially in children: in fact, any great disproportion in the natural development of different parts of the body, must necessarily predispose to unequal distributions of blood, and this is one source of those peculiarities of constitution termed idiosyncrasies.

Plethora may exist more exclusively either in the veins or arteries; and this difference is in a great measure connected with the period of life. The arterial system being most developed and in greater activity in childhood and youth, active arterial congestion is most common at these ages. As the rigidity of the solids augments with age, the arteries in particular acquire a greater degree of density, and a greater number of the minute arteries become obliterated; a larger quantity of blood is consequently thrown into the veins, whose coats offer less resistance than those of the arteries; and the venous system becomes in this manner gradually more distended with blood towards the decline of life, and more liable to be the seat of congestion. (See the Physiological Speculations of Sir Clifton Wintringham; Cullen's Nosology, book iv. chap. 1.) The different periods of life are characterized also by a greater tendency to plethora and active congestion in certain organs than in others; thus, in childhood and youth the brain and thoracic viscera are principally affected, the abdominal viscera in adults, and the brain and abdominal viscera in old age.

Local plethora may be the result of habits of life and modes of employment. Intense study creates habitual plethora in the brain; occupations requiring a low position of the head and great straining of the sight produce a similar effect. The people employed in Italy in the manufacture of mosaics suffer greatly on this account from congestive and inflammatory affections of the brain and eyes; and the same is observed in a variety of other trades. The seasons and climates exercise a considerable influence over the distribution of the blood. Heat stimulates the activity of the circulation, and creates a tendency to plethora in the skin and superficial parts of the body during spring and summer, as is shown by the prevalence of the exanthemata and other cutaneous affections: this is likewise the case in tropical climates, where some cutaneous affections assume a highly inveterate character. Excessive heat is known also to create a strong predisposition to hepatic congestions and disordered biliary secretions. The application of cold to the surface lowers the activity of the circulation, and repels the blood towards the centre; and hence the great tendency to congestions in the lungs, brain, and mucous surface of the alimentary canal, during winter and in cold climates. The sudden exposure to intense cold has often been instantaneously followed by an attack of apoplexy: the influence of variations of temperature is greatly increased by their occurring suddenly. These changes in the circulation are not the effect merely of the heat of the atmosphere, but also of the different degrees of pressure it exercises on the body according to the variations in its density. Thus, a condensed, pure, and cold atmosphere adds by its pressure to the power of the solids to resist the impulse and distension of the fluids; and the quantity of blood on the surface of the body being thereby lessened, a certain degree of *internal* plethora is the result: whilst in a heated, rarefied, damp, and impure atmosphere, the vessels of the surface being subjected to less pressure, are more relaxed, admit a larger quantity of fluids, and there is a consequent tendency to *external* plethora.

Some ancient pathologists conceived that there were certain conditions of the body independent of the effect of heat and cold, which give rise to alternate states of condensation and rarefication of the fluids, and which they referred to some particular influence of the nervous system. They explained in this way various sudden congestions whose occurrence could not be traced to any irritation or mechanical cause; they accounted in the same manner for the great extrication of gaseous fluids observed in some nervous diseases, such as hysteria. The motions of the fluids, and their degrees of rarefaction and density, have been supposed by some modern pathologists to be partly regulated by electricity; but these speculations, however interesting, do not yet appear to rest on sufficient evidence to be applied to practical purposes.*

The last of the causes of local plethora to which we shall allude, is of a mechanical nature,—that arising from tight bandages habitually worn over different parts of the body. Every medical man must have had numerous opportunities of witnessing the highly injurious consequences of this pernicious practice, especially in women; they are too obvious to require further illustration.

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* See the researches of Dr. Reuss of Moscow, published some years ago; the more recent experiment, also, of Dutrochet in France, and Faust and Mitchell in America, on the endosmosis and exosmosis of fluids and gases.

The introduction into the animal economy of a contagious virus, or of any other deleterious principle, such as putrid miasmata, &c. has generally the effect of exciting congestions more or less active in several organs at the same time, as is observed in a number of infectious diseases, such as measles and scarlatina, typhoid and malignant fevers; or after the administration of poisons. These deleterious principles vitiate the quantities of the blood, disturb the whole nervous system by either irritating or depressing it, and thus create active congestions in the brain and alimentary canal.

One of the frequent terminations of congestive irritation of the blood-vessels is hemorrhage, either within the texture of the part affected, or on its surface. When there are no means of escape for the blood, the consequences are often extremely dangerous; as in apoplexy, and likewise in hemoptysis, when the blood is only partially expectorated, and a portion retained within the pulmonary texture. Where, however, the blood can issue freely, the hemorrhage frequently relieves the congestion, as in epistaxis, hematemesis, menorrhagia, &c. This timely hemorrhage often prevents the congestion from passing into inflammation; whilst the repression of the hemorrhage, whether spontaneously or by artificial means, has been sometimes immediately followed by formidable symptoms of inflammation. Hemoptysis has in this way been converted into pneumonia; hematemesis into gastritis; menorrhagia into metritis. The hemorrhage may also prove hurtful by causing an excessive loss of blood, either in one or successive attacks; there is a great tendency to hemorrhagic action in certain constitutions, depending most probably on some condition of the blood-vessels leading to congestive irritation; other constitutions being more predisposed to serous effusions. It should be observed, however, that hemorrhage may occur without any previous congestion of the blood-vessels, either active or passive, the parts after death not presenting the slightest morbid appearance; this must be owing to some modification in the texture of the parietes of the vessels, or to some peculiarity in the qualities of the blood; as, for instance, when reduced to a thin watery state, so that it escapes from the vessels as fast as it arrives. This species of hemorrhage is observed in scorbutus and in the hematuria of old age.

Inflammation is one of the most natural and important consequences of congestive irritation. The development of many formidable diseases may be prevented if the congestive stage of the inflammatory process can be removed by the timely application of appropriate remedies. Active congestions are sometimes only temporary, and quickly subside: when of long duration, they frequently occasion various alterations in the nutrition and secretions of the part, which they either increase, diminish, or vitiate. They sometimes assume an intermittent and periodical character, as in some forms of cephalalgia, dyspnœa, &c.

Passive Congestions.—It has been already stated that congestions are frequently formed without any previous irritation or increased activity of the circulation, and that they may be the effect of a relaxed state and deficient activity of the vessels, of a vitiated condition of the blood, or of some mechanical obstruction to its course: in these cases the congestion is termed *passive*. Passive congestion is characterized by various degrees of redness and sometimes tumefaction, but is distinguished from active congestion by the absence of pain and heat.

The accumulation of blood in the passive congestion sometimes becomes a source of irritation, and the congestion then assumes an active character. On the other hand, a congestion, which was at first active, may after some time become passive. There are, therefore, two forms of passive congestion, the one *primary*, and the other *secondary*.

The principal causes of passive congestion, viz. relaxation of the small vessels, languor of the general circulation, and a thin vitiated state of the blood, are combined in the scorbutic constitution; there is consequently a remarkable tendency in scorbutus to passive congestions and extravasations of blood in all vascular textures. In cases of general debility of the powers of life, and deficient energy of the capillary system, the blood has the greatest tendency to accumulate in those portions of the vascular system the most remote from the propelling influence of the heart, and in which the circulation is chiefly carried on by the contractility of the extreme vessels; and this is still more likely to occur where the blood in its passage from the capillaries into the veins has to overcome the force of gravitation. The lower extremities of old people are sometimes affected, owing to the operation of these causes, with spots presenting an injected, dark-red, marbled appearance, sometimes varicose or in a state of ecchymosis. (*Andral,* Op. cit. vol. i. p. 50.) In some cases there is a complete stoppage of the circulation, stagnation and coagulation of the blood; the vitality of the part is destroyed; it becomes cold and insensible; assumes a dark livid colour; and a form of gangrene frequently supervenes, called the *gangrene senilis.* A similar affection is of frequent occurrence in certain forms of fever, and other diseases attended with great nervous debility and a vitiated state of the blood; the application of any slight irritation to the skin, especially in the dependent parts of the body on which the patient lies, such as the back, sacrum, and nates, is followed by the appearance of red patches of congestion; these, at first acute, soon become passive, and assume a gangrenous appearance.

All the internal organs are subject to passive congestion. When death is attended with violent struggles, as is the case from the convulsions of tetanus, of asphyxia, by strangulation, or from the effects of certain poisons, many of the internal organs, and particularly the brain, are found loaded with blood, and more or less injected. When after protracted diseases death occurs very gradually, the lungs are sometimes found gorged with blood and serum, although there was no previous symptom of pulmonic affection. These changes occur more particularly in the posterior portion of the organ, when the patient lies constantly on the back. They can only be referred to debility of the capillaries and passive congestion, as they were not preceded by irritation. After the inflammation has been subdued in acute pneumonia, and convalescence is established, there remains in some cases a certain degree of dyspnœa and crepitating rhoncus, although the thorax has recovered its natural sound on percussion, and these symptoms resist the continuation of antiphlogistic remedies, whilst they yield readily to the employment of tonics. The congestion of the bronchial membrane in chronic catarrh frequently requires a tonic plan of treatment, and it may be fairly concluded in both these cases that the vessels are in a relaxed and passive condition.

There is a great predisposition to passive congestion in the mucous membrane of the alimentary canal. This is not surprising when we consider how largely it is supplied with blood-vessels, their subdivision into numerous arches supported only by a loose membrane, and, above all, the peculiarities of its venous circulation; for the venous blood of the alimentary canal being distributed to the liver by veins deprived of valves, the slightest obstruction to the circulation of that organ, which is naturally slow, must have the effect of retarding the return of blood from the intestines, and creating an accumulation in their venous system. This accounts for the frequency of hemorrhoidal affections, diarrhœa, and dysentery, in chronic affections of the liver. In fevers of a low, nervous, and malignant type, the mucous membrane of the intestines, and chiefly of the colon, is sometimes found of a uniform dark-red colour, turgid and soft, in consequence of an intense venous injection of a passive character, the black pitchy secretions of the membrane resembling decomposed genous blood. (Dr. Armstrong made these convestions the foundation of one of his divisions of fever, which he termed *congestive.*) In a case of this description the mesentery was covered with large dark-red blotches, giving it the appearance of a leopard's skin, and arising from a state of intense injection of the mesenteric veins with extravasation of blood, the congestion having fallen on the mesentery instead of the coats of the intestines. The mucous membrane presents frequently similar appearances in melæna; and in a case of recent occurrence we found it impossible to discover the least difference between the black sanguineous fluid contained in the intestines, and the blood taken from the vena portæ.

Mechanical compression or obliteration of any portion of the venous system, is necessarily followed by passive congestion in all the parts whose blood is returned to the heart by the obstructed vessels. When this obstruction occurs either in the lungs or heart, it produces passive congestion in all the organs of the body. This is particularly well exemplified in asphyxia, in which the face becomes livid and swollen, the lips purple, the tongue tumid, the eyes red and staring, and the whole surface of the body injected with dark blood. The lungs, right cavities of the heart, and entire venous system are found distended with venous blood, whilst the left cavities of the heart are nearly empty; the mucous membranes of the lungs and alimentary canal are also deeply injected. When the obstruction in the pulmonary circulation takes place gradually, as in pulmonary consumption, the same general congestion is not observed, because the absolute quantity of blood in the whole system is diminished by long-continued imperfect sanguification, deficient nutrition, and increased excretions. A nearly similar state of general passive congestion is sometimes produced by diseases of the heart, whether congenital, as in the morbus cœruleus, or acquired.

Serous congestions.—The order of vessels which convey only the colourless or serous portion of the blood, are liable also, as before stated, to be affected with congestive irritation. These vessels exhale in health a sero-albuminous fluid or vapour, which constantly lubricates the areolæ of the cellular tissue, the cavities lined with serous membranes, the mucous and cutaneous surfaces, and, in fact, every part of the body. It can be satisfactorily shown, by a variety of experiments, that this fluid is supplied by the serum of the blood. If, for instance, a solution of prussiate of potash be injected into the veins, it can be immediately detected in the fluid of the serous membranes by means of sulphate of iron. (*Andral*, Op. cit. vol. i. p. 379.) Serous and sanguineous congestions are not unfrequently combined; the former may, like the latter, occur without previous irritation, and be passive.

Congestive irritation of the colourless vessels is generally followed by an increased exhalation of serous fluid, which is either retained in the areolæ of tissues and closed cavities of membranes, constituting different forms of effusion, or, when poured out on the mucous and cutaneous surfaces, is carried off in the form of increased excretions.

Those portions of the cellular tissue, the texture of which is loose and the position dependent, are the most frequently the seat of serous effusions. The dense cellular tissue lining mucous membranes is not, however, exempt from serous infiltration; the membrane is then raised, loose, and flaccid, as is well exemplified in that fatal disease, œdema of the glottis. When serous effusions occur in the membranes investing vital organs, they often give origin to various formidable and fatal diseases. The investigation of their causes is, therefore, deserving of some consideration. These causes may be divided into increased action of the vessels, debility of the vessels, alteration in the qualities of the blood, and mechanical obstructions to its circulation.

Serous effusions may take place from irritation and increased activity of the secreting vessels, without the cellular tissue or serous membrane undergoing any alteration of texture, or presenting even the slightest appearance of sanguineous congestion. If the irritation be slight, the effused fluid corresponds exactly in its composition with the serum of the blood, consisting of a large proportion of water (900 in 1000 parts), a small quantity of albumen (80 in 1000), and the remainder made up of soda, various salts, and an animal matter analogous to mucus. (*Andral*, Op. cit. vol. i. p. 389.) Under certain circumstances not connected with irritation, the effusion contains also a substance called extracto-mucus, either uniformly combined and giving it a slight turbid appearance, or floating in the midst of the fluid in small filaments or flocculi. As, however, the irritation increases, the proportion of albumen becomes considerably greater, and this substance is therefore a good test of the violence of the irritation. When the congestive irritation reaches the point of true inflammation, the disease is characterized by other morbid changes; there is an exudation of coagulable lymph and pus, which, being mixed with the serous fluid, gives it a turbid appearance; the surface of the membrane itself is lined with layers of lymph; its blood-vessels and those of the subserous cellular tissue are deeply injected, and blood is sometimes extravasated by their rupture. The absence, however, of any trace of vascular injection in a serous membrane, after effusion has taken place, must not always be considered as a sure proof that it never existed; for there may have been considerable sanguineous congestion in the first period of the disease, which has disappeared after the turgidity of the vessels has been relieved by the exhalation of the distending fluid. We accordingly often observe the symptoms of local and general irritation in acute affections of the cellular tissue and serous membranes, completely subside the moment the effusion has taken place; and we may frequently predict an accession of effusion by the return of these symptoms. It may, therefore, be received as a general rule that a state of congestive irritation, both of the sanguineous and serous vessels, especially when long-continued, is more favourable to acute dropsical effusions than active inflammation; that active inflammation is attended with a greater disposition to the formation of adhesions and false membranes, or to the exudation of pus and blood, than to copious serous effusions, the function of secretion being rather suspended than accelerated during the inflammatory process. The fever and other constitutional symptoms which precede effusions into the cavities of the head, chest, and abdomen, are accordingly, in the majority of cases, rather of a sub-acute than highly inflammatory character; and it is extremely important to keep this circumstance in mind, as the mild and insidious nature of the symptoms has frequently concealed the real danger of the disease. Serous effusions take place also, no doubt, in the course of severe attacks of inflammation; but effusion is then almost always combined with suppuration and the formation of pseudo-membranes, and it generally occurs when the inflammatory action is on the decline. We have examples of this in pleurisy and peritonitis.

In recent cases the texture of the serous membranes is generally unaltered; but when serous congestion has been of long standing or frequent recurrence, the membrane becomes thickened and of an opaque white, in consequence of the infiltration of the serous fluid between its layers. A similar infiltration takes place into the subjacent cellular tissue, which on this account adheres to the membrane when raised, and increases its thickness; this happens more especially where the subserous cellular tissue is loose and abundant, as, for instance, between the arachnoid and pia mater. The free surface of the membrane loses also its smoothness and polish, becoming rough and granulated. In some severe and very protracted cases, the membrane is thickened and even cartilaginous, in consequence of vitiated nutrition. The serous fluid may be either colourless or of a green, yellow, or reddish tint, owing to the presence of a portion of the colouring matter of the blood; it is sometimes mixed with a yellow colouring matter analogous to that of the bile, and has in some cases been found to contain uric acid.

The effusion may be occasioned by a primary irritation of the tissue in which it is formed, or a secondary irritation propagated from a neighbouring part. (*Andral*, Op. cit. vol. i. p. 393.) Hydrocephalus is in most cases to be attributed to irritation in the brain; ascites is sometimes consecutive to peritonitis; erysipelas, phlegmon, and all extensive and deep-seated inflammations, are attended with œdema of the adjacent cellular tissue. Effusions depending on congestive irritation are characterized by local and constitutional symptoms more or less acute; when they occur in the subcutaneous cellular membrane, as in œdema and anasarca, there is swelling and some degree of heat, pain, and tension; this corresponds with the diffuse inflammation described by the late Dr. Duncan. When the effusion takes place within any of the splanchnic cavities, or in the texture of important organs, there are a variety of local symptoms more or less severe according to the impediment occasioned in the functions of the organ. The constitutional symptoms vary considerably, being sometimes violent, at others mild, obscure, and insidious; this depends very much on the suddenness of the affection, as well as on idiosyncrasy, and other circumstances. A slight degree of congestion and effusion occurring suddenly may give rise to very violent symptoms and prove rapidly fatal; whilst a higher degree of congestion, and the effusion of a larger quantity of fluid, if it only takes place gradually, is sometimes attended with comparatively little inconvenience, there being time for the parts to accommodate themselves to the distension occasioned by the fluid.

The following enumeration of the diseases in which effusion occurs as a consequence of congestive irritation of the serous vessels, will show the importance of attending to this species of diseased action. It affects both sides of the arachnoid, the pia mater, the lining membrane of the ventricles of the brain, and the medulla spinalis, in arachnitis, hydrocephalus, and hydro-rachitis; the pleura in pleurisy and hydrothorax; the pericardium in pericarditis and hydrops pericardii; the peritoneum in ascites; the ovaries in hydrops ovarii; the tunica vaginalis in hydrocele; the joints and surrounding parts in hydrops articulorum, and also the bursæ mucosæ of tendons; the cellular tissue in œdema and anasarca; the globe of the eye in hydrops oculi. The parenchyma of several organs may also be the seat of serous congestion and effusion; the white softening of the brain seems to depend on a species of serous infiltration, there is a serous congestion of a sub-acute character called œdema of the lungs, which is in general very obscure and intractable, and a frequent, though unheeded, cause of anasarcous swellings in different parts of the body.

Serous congestion and effusion depend sometimes, as already stated, on debility of the vessels without previous irritation, being what is termde *passive*. In order to give a connected view of the pathology of these affections, we shall offer a few observations on this and some other causes of serous congestion, although not immediately connected with inflammation. When the powers of the constitution have been considerably reduced after protracted diseases, excessive evacuations of blood, or in old age, especially in temperaments naturally leucophlegmatic, serous effusions sometimes occur, to all appearance, from mere debility; the lower extremities, where the blood has to overcome the greatest degree of gravitation, are most commonly first affected. Effusions from mere vascular debility are, however, by no means so frequent as was formerly imagined. It more generally happens that there is combined with debility some other cause, such as alterations in the quantity or qualities of the blood, or obstruction to its circulation.

Since the fact of absorption being actively carried on by the veins as well as the absorbents has been fully established by the experiments of Magendie, nothing can be more obvious than that the distension of the venous system by an excess of blood must have a special influence in the production of serous congestions and effusion, by retarding the current of the blood, causing an accumulation in the minute vessels, and lessening the activity of absorption. There are cases of œdema and anasarca which can be attributed to no other cause than extreme plethora; a remarkable one, which terminated fatally, is related by Andral. That effusion may occur from this cause is clearly proved by the fact of our being able to produce it at will by injecting into the veins a large quantity of water, so as to create a state of artificial plethora. That the absorption of the veins is greatly accelerated when in a condition opposite to that of plethora is also satisfactorily proved; for if in the same animal we remove the plethora by abstracting blood from the veins, the serous effusions soon disappear: this explains the good effects that follow venesection in acute dropsical affections.

A diminution in the proportion of fibrine and red matter, and a corresponding increase in that of the serosity of the blood, greatly favours serous congestions and effusions: this state of the blood is induced by copious and repeated venesections, which are sometimes followed by dropsical effusions. The long-continued use of a poor and watery diet produces similar results, although the mass of the blood may be diminished in quantity. The coagulating property of the blood is destroyed also by some poisons, especially those of reptiles; its fluidity is thus increased, and it assumes a decomposed appearance; the unhealthy malignant inflammation excited by these poisons is accordingly combined with serous infiltrations.

Any obstruction to the venous circulation has a tendency, for the reasons already stated, to induce sanguineous congestions and serous effusions. The obliteration of the principal veins of a limb from inflammation, the pressure of a tumour, or other causes, is generally followed by œdema of the limb below the obstruction. The obliteration of the inferior vena cava causes dropsy of the lower extremities: obstacles to the circulation of the vena portæ, arising from diseases of the liver, are among the most frequent causes of ascites. Several diseases of the kidneys, which have been well described by Bright, Christison, and Gregory, produce a similar effect. When the cause of obstruction occupies the central organs of circulation, as in diseases of the heart and lungs, the dropsical effusions affect every part of the body.

Impediments to the cirsulation in the lymphatic vessels, which may be considered as a species of veins, are sometimes followed by serous effusions in consequence of a diminished absorption; this is exemplified in tabes mesenterica and in obliterations of the thoracic duct. In some cases of chronic serous effusions, Dr. Hodgkin has found the lymphatic glands enlarged and indurated without any evident change of structure, but in a state rather analogous to hypertrophy.

Besides the primary causes of serous congestion and effusion that have been enumerated, there are various secondary causes, amongst which may be noticed the suppression of secretions, and especially that of the skin and bronchial membrane. Dropsical affections are very common in low and damp situations, which is chiefly to be attributed to the action of a moist atmosphere in lessening cutaneous and pulmonary perspiration. Copious serous effusions disappear sometimes with surprising rapidity; the fluid is in some cases transferred to another part, giving rise to a new train of symptoms; it is frequently, however, carried off by copious excretions. But there are instances of the general health being re-established without any such evacuations.

When the *mucous* and *cutaneous* surfaces are affected with congestive irritation of their serous vessels, it generally induces profuse serous excretions. These surfaces secrete two kinds of fluid, one in the form of a vapour or thin serosity exhaled by the serous vessels, such as the cutaneous and pulmonary perspiration and the watery evacuations from the bowels; the other consisting of the mucus and other secretions supplied by the mucous and sebaceous follicular glands. Very large quantities of these various secretions proceed sometimes from the skin and mucous membranes, without any morbid change in the structure of these parts, or such slight deviations only from their healthy appearance as are in no way proportionate to the severity of the symptoms. These profuse discharges can only therefore be referred to a degree of congestive irritation not amounting to inflammation. If, however, the secretions be checked, either by astringent remedies or spontaneously, the congestive irritation may be converted into active inflammation; and in this manner dysentery and enteritis have sometimes supervened on an attack of diarrhœa. (*Andral,* Op. cit. vol. i. p. 412.) These profuse evacuations, when occurring in mucous membranes, were called by the ancients *phlegmorrhagiæ, phlegmatorrhagiæ,* or *fluxes.* Pyrosis, and some forms of coryza and pulmonary catarrh, have been classed by several nosologists among the phlegmorrhagiæ. At the invasion of coryza and pulmonary catarrh there is sometimes a very copious discharge of a watery fluid, either from the nose or by expectoration. The pituitary membrane is tumefied, but without increased redness, and the entire nose sometimes swollen. The quantity of serous fluid proceeding in some diseases from the mucous membrane of the stomach and bowels is enormous; it has amounted to several quarts thrown up from the stomach in some cases of pyrosis, and much larger quantities have been discharged by stool from the bowels in attacks of cholera and colliquative diarrhœa. These profuse excretions generally induce symptoms of as great prostration of strength as from excessive loss of blood; the skin becomes cold and clammy; all other secretions are suspended; the rapid sinking of the strength brings on paroxysms of syncope and convulsions; the blood also assumes a dark red colour, being deprived of its serum. These serous fluxes have sometimes supervened on the sudden disappearance of dropsy either of the abdominal or thoracic cavity, and have in this way proved critical; they may occur also at the termination of febrile and inflammatory diseases, whose resolution they seem to favour.

The cutaneous perspiration is exhaled in health under the form of an imperceptible vapour. But in many diseases there is a state of congestive irritation of the skin, either primary or sympathetic, characterized by a morbid heat, and the excretion of a profuse serous fluid constituting sweat. These perspirations may likewise be critical in a variety of inflammatory and febrile diseases; in the *morbus sudatorius* they constitute the prominent symptom. They are sometimes passive, being then cold and clammy, as at the approach of death. A remarkable alternation of action is observed in some cases between the skin and mucous surface of the alimentary canal, the suppression of a profuse sweat being followed by diarrhœa, and *vice versâ*. The diarrhœa which attacks the crews of whalers on entering the regions of ice is of this nature. The skin is generally dry and rough in chronic gastritis. In pulmonary phthisis, and other organic affections of the lungs in which the pulmonary perspiration is diminished, there is generally an increase of the cutaneous perspiration, which may be considered as its substitute. The qualities of the perspiratory fluid are modified in several diseases, as is manifest by peculiarities in its odour and flavour, and by the action of chemical tests.

All *glandular* structures, such as the follicles of the skin and mucous membranes, the salivary glands, liver, kidneys, &c., may be affected with congestive irritation of their secreting vessels leading to increased excretions, without any change of structure or appearance even of vascular injection. In all catarrhal affections there is an increased secretion of mucus from the different mucous surfaces; this, no doubt, is sometimes the effect of inflammatory action; but in numerous cases there is merely a congested state of the serous vessels, and not the least appearance of increased action of the blood-vessels, as is clearly demonstrated by numerous post-mortem examinations. Nothing, therefore, can be more erroneous than the opinion of some modern pathologists, that all catarrhal affections are to be referred to inflammation. Andral very justly observes "that it would be a great error to suppose that the fever which accompanies certain acute mucous fluxes is an infallible proof of their inflammatory nature: for the simple fact of an organ being deranged in its nutrition, secretion or innervation is sufficient to generate fever, no matter whether that derangement be attended with the augmentation, diminution, or perversion of the vital powers of the organ; the bare circumstance of a part of the living body being in a state of suffering, whatever the nature of that suffering be, is sufficient to light up the various sympathies which constitute *fever*. The existence of fever does not, therefore, necessarily imply the idea of stimulus or of excessive action; and, consequently, the object of the practitioner should not, in every case of fever, be to combat this stimulus; but in some cases it should be to relieve a derangement, either circumscribed and purely local, or affecting generally the blood itself, or the centres of the nervous system." This view of the subject is the most consistent, certainly, with sound reasoning and general experience. It is, moreover, now generally admitted that many of these catarrhal affections, when the period of irritation that attends their invasion has subsided, are aggravated by perseverance in an antiphlogistic plan of treatment, and are speedily relieved by tonic remedies and a nourishing diet. This is particularly evident in chronic pulmonary catarrh and in mucous diarrhœa, to which complaints persons of a relaxed phlegmatic temperament, and much exposed to wet and cold, are particularly predisposed. The secretions of the lachrymal and salivary glands, of the liver and kidneys, may likewise be considerably increased in consequence of congestive irritation of their secreting vessels.

All the affections that have been described as depending on congestive irritation of the sanguiferous or serous vessels, may assume a continued, intermittent, sporadic, or endemic form. The various secretions are in general considerably under the influence of the nervous system, and may be suddenly increased or diminished by strong mental emotions; we need only mention, in proof of this, the well-known effects of fear on the secretions of the bowels and kidneys.

It is evident, from what has been stated in this section, that the morbid condition of the vessels which we have termed *congestive irritation*, includes a great variety of diseases, some of a formidable character, and the exact nature of which has not always been clearly understood. Many of these diseases originate in a high state of congestive irritation closely allied to inflammation; the danger, however, is not always in proportion to the degree of irritation, for we have seen that some diseases characterized by only slight congestive irritation, may in certain constitutions lead to a fatal result, by inducing effusions round vital organs, or exhaustion of the nervous power from hemorrhages and excessive excretions; and that the danger in these cases is so much the greater, that their symptoms are often obscure and insidious. It has also been shown that when, in consequence of the influence of morbid sympathies, congestive irritation has been excited in several vital organs at the same time, the simultaneous disturbance of their functions, and consequent unequal distribution of the circulating fluids, may give rise to the most formidable symptoms, and prove as certainly fatal as the destruction by inflammation of any vital organ. We have seen, also, that with regard to the treatment of congestive diseases, the practitioner must be on his guard lest the obscure and often insidious character of the symptoms should deceive him respecting the true nature of the disease; that these affections being all more or less allied to inflammation, generally require an antiphlogistic plan of treatment: that this, however, will sometimes require to be carefully modified, and is likely to prove injurious if carried beyond a certain point, as congestive diseases are often induced and aggravated by a state of general debility.

Morbid Appearances of Inflammation.—There are few things in the study of pathology more difficult and of greater importance than to define accurately what are the appearances in the dead body by which the different morbid affections of the vascular system, from the state of slightest injection to that of high inflammation, can be distinguished from each other. Accuracy of knowledge on this subject is evidently highly desirable, as our views of the nature of disease can be derived only from the combined evidence afforded by the symptoms observed during life, and the deviations from healthy structure found after death. Before, however, entering upon the consideration of this important part of our subject, it is necessary to premise that a variety of morbid changes of structure sometimes take place, both at the moment of death and at a certain period after, bearing a close analogy to those induced by disease: a knowledge of these changes is of the first importance to prevent their being erroneously attributed to disease.

In speaking of the functions of the minute vessels, we stated that their contractility survived for some time the action of the heart; that in consequence of this they continued to propel the blood into the capillaries and small veins in which it necessarily accumulated, while the larger arteries, not receiving any fresh supply of blood, remained empty. This sufficiently accounts for the circumstance of all delicate vascular textures, the surfaces of mucous and villous membranes; the pulp of the brain, texture of the lungs, &c. often presenting an unusually red and injected appearance in the bodies of persons who die with much blood in their system; these congestions bear a strong resemblance to the passive congestions that are formed during life. They vary according to the manner in which the circulation has been first interrupted, whether in one or both sides of the heart, or in the vessels of one particular organ. The different parts of the body may, however, assume also various degrees of redness and injection after death, which it would be a serious mistake to attribute to the effects of disease. The formation of these congestions can easily be proved by experiment; for if the colour and degree of injection of different organs be noted immediately after death, and the same organs be examined again at different successive periods, parts naturally white will be observed to become red, vessels and patches of ecchymosis become apparent where none could previously be seen. It is possible, indeed, to produce at pleasure a red congested appearance of the lung in any one of its surfaces, by letting the body lie for some time on its back, side, or face, and to bring about a similar result in any portion of the intestines by suffering it to hang in a dependent position. Numerous experiments were made on this subject by Rigot and Trousseau; and the blood sometimes oozes in such quantity as to accumulate in the cavity in the form of a hemorrhage. These sanguineous congestions are formed not only when the mass of the blood is considerable, but also after protracted diseases.[*]

These congestions are principally observed on the exterior of the body in the most dependent parts of the skin, such as the back and calves of the legs, which present a uniform livid red colour, disposed in stripes or patches. Red streaks, either parallel or intersecting each other, are also sometimes seen on the arms, thighs, thorax, and abdomen, and not confined to the dependent parts of the body; the vessels of all these parts, especially the veins, are found minutely injected with black blood; the streaks occur in the course of large veins, and seem to be the effect of the transudation of their blood staining the surrounding tissues. During the last moments of life, owing to the weakened action of the heart, there is not so much blood propelled to the surface, and it has a tendency to accumulate in the internal organs; the internal cadaveric congestions present a uniform red tint, disposed also in isolated spots, stripes, or patches; the blood escaping from its vessels forms effusions, and stains the neighbouring tissues; if there exist previously serous effusions, they become tinged with the colouring matter of the blood; there is also extravasation of the serous fluids; and effusions take place into the cavities of serous membranes or in the cellular tissue; the bile likewise transudes through the gall-bladder, and stains the surrounding parts. All these appearances are more particularly found in the membranes of the brain lining the posterior part of the skull, and in the posterior part of the spinal canal; in the lobes of the cerebellum, and posterior lobes of the cerebrum; in the posterior portion of the lung; the most dependent portions of the stomach and intestines, and in the kidneys. These parts present sometimes a uniform deep red colour, resembling the most intense congestion.

At a later period, when putrefaction commences, various gases are disengaged, and particularly sulphuretted hydrogen, which penetrate the coats of the blood-vessels as well as all other tissues, change the colour of the blood, and produce the various tints of brown, livid, and green, that characterize putrefaction. These changes of colour are first noticed on the concave surface of the liver, in consequence of its vicinity to the transverse arch of the colon; they next manifest themselves in the abdominal muscles, and subsequently in the integuments.

Congestions after death are formed, therefore, in three different ways: by the gravitation of the fluids within their vessels; by transudation of the fluids through the parietes of the vessels and imbibition of the neighbouring tissues; and by chemical affinities.

The nature of the first species of cadaveric congestion is sufficiently obvious not to require any explanation. The fact of the transudation of fluids through the membranous parietes of vessels, and of all animal tissues having in a certain degree the property of imbibition even during life, has been clearly established by the experimental researches of Magendie, Foderé, and Dutrochet: the functions of exhalation and absorption seem to be, partly at least, carried on by transudation and imbibition. The vessels and serous membranes are, however, considerably less permeable to the fluids they contain during life than after death, which is partly attributed by Magendie to the current of circulation constantly conveying away the fluids before they can accumulate in any part; the solids are also endowed by their vital principle with a greater degree of density and power of resistance during life, whilst after death the physical laws acquire their full influence.

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[*] Andral. Op. cit. vol. i. p. 83. This chapter contains a very full and interesting account of the occurrence of congestions and effusions after death.

The patches and stripes of uniform red are the effect of this property of transudation and imbibition; the tissues appear as if soaked in blood and stained with it. This uniform red tint is frequently observed on the internal coat of the blood-vessels and of the heart; it is of a vermilion red in the arteries, and of a darker red in the veins: the redness penetrates all the coats of the smaller and thinner vessels, and extends sometimes to the adjacent tissues: the vasa vasorum of the large vessels are minutely injected. These appearances in the blood-vessels are almost constantly found at the end of twenty-four hours in the bodies of persons who have died from an obstructed state of the circulation, or from diseases in which the blood is preternaturally fluid. The small quantity of colourless or reddish serous effusion found in almost every body in the arachnoid of the brain and spinal marrow, in the pericardium, pleura, and peritoneum, thirty-six hours after death, is to be attributed also to transudation. Congestions and effusions from transudation occur most frequently in those diseases in which the blood is thin, and retains its fluidity after death, such as scorbutus, purpura hemorrhagica, and all diseases usually called putrid: they are seldom observed in the neighbourhood of large veins and arteries on account of the thickness of their coats; they are greatly facilitated by the rapidity of putrefaction, and therefore materially influenced by the heat and moisture of the atmosphere.

With regard to the effects of chemical affinities, it is important to remark that, when a portion of lung, intestine, or brain, presenting little or no vascularity, has been exposed for a short time to the atmosphere, it assumes a bright scarlet appearance, resulting from the arterialization of its blood, which, being thus more highly coloured, is apparently increased in quantity. We have already stated that the gases evolved by putrefaction give the blood a brown, livid, or green hue; the texture of the part becomes more friable and flaccid, and these appearances have, we apprehend, been sometimes mistaken for gangrene. Further details of the cadaveric appearances will be found in Andral's Pathological Anatomy, (vol. i. article 4, p. 70,) and in the works on Medical Jurisprudence by Foderé, Paris, and Beck, [Devergie, Guy, and A. Taylor.]

We have thought it desirable to describe at some length these cadaveric appearances, feeling the great importance of their not being mistaken for the effects of disease, especially with respect to forensic medicine. There is, perhaps, no point in pathological anatomy which has given rise to greater diversity of opinion, has proved a more fertile source of error, and remains yet more undetermined, than the exact nature of the morbid appearances which separately characterize congestions both active and passive, and inflammation. This is in fact a subject often surrounded with many difficulties, an ignorance of which has led to the erroneous practice of pronouncing hastily and indiscriminately as inflammatory, appearances of redness, injection and turgescence, belonging perhaps only to either active, passive, or cadaveric congestion. We shall therefore point out, as far as we are enabled in the present state of pathological knowledge, the characteristic signs by which we can establish a line of demarcation in the dead body between these various morbid appearances.

1. The existence of various degrees of *redness* in any tissue, depending on minute vascular injection, is not alone sufficient to indicate inflammation, as redness is produced also by several forms of congestion. An increase of volume likewise is not always characteristic of inflammation; it may arise from the distended state of the vessels, or the slight serous effusions that occur in congestions both active and passive. Increase of volume may depend, moreover, on a morbid activity of the functions of nutrition and secretion, causing a diseased growth of texture without the necessity of an inflammatory action. Congested tissues become also more soft and friable in consequence of the greater quantity of fluids they contain. The redness and increased thickness of a membrane and softening of its texture cannot, therefore, be always considered unequivocal marks of inflammation.

The following are the only sure signs of genuine inflammation: considerable increase of vascularity with extravasation of blood or coagulable lymph, and the formation of pus or other morbid products, leading to a decided change in the structure of the part affected. The presence of all these signs at the same time is not, however, required: there are variations in this respect, according to the texture of the part, the intensity and duration of the inflammation. A very minute injection, chiefly of the small arterial branches; a vivid red colour, disposed in dots or striæ occupying the whole thickness of the tissue, and not removable by pressure or ablution; spots of ecchymosis, occasioned by the rupture of some of the small vessels; effusion of blood on the surface, or its infiltration within the texture of the part, are all characteristic of recent inflammation. The exudation of coagulable lymph, the secretion of pus, and the formation of ulcers, indicate a more advanced period of inflammation. This, however, is not constant, as both lymph and pus are sometimes poured out, and ulcers very rapidly formed in certain soft tissues, as, for instance, in mucous membranes. The organization of lymph and conversion into new tissues, the complete organization of abscesses, and the formation of purulent sinuses, point out inflammation of longer standing: the minute vascularity and redness have in this latter case generally disappeared.

2. Injection, redness, and patches of ecchymosis exist also in passive congestion; but the injection then is seated principally in the veins. The

redness is of a dark-brown hue rather than florid; the blood extravasated is thin and fluid, and the red colour is easily removed by ablution: the texture of the solids is soft, flabby, and easily torn, and the condition of the whole body usually indicates a state of cachexia. Active congestions are distinguished from passive by the vascular injection occupying chiefly both the large and small arteries, the net-works formed by their extreme ramifications being so minutely filled with blood as to impart to the tissue an intensely bright red colour; the blood is generally very viscid, and the texture firmer than in passive congestion. This is a condition of parts bordering on active inflammation, although no distinct change of structure has yet taken place. It is often described as inflammation, and the mistake is not perhaps of much practical importance, since they both frequently give rise to the same local and constitutional symptoms, and require the same mode of treatment; the morbid appearances belonging to inflammation and active congestion are, moreover, often united in the same organ; active congestion is most frequently attended with serous effusions or hemorrhage; inflammation, more generally with the effusion of coagulable lymph and pus, or ulceration. It must, however, be acknowledged that the distinction between active and passive congestion is often extremely difficult, if not impossible; and it will be necessary in general to attend to other circumstances besides the morbid appearances; such, for instance, as the mode of death, whether it has been sudden and rapid, or lingering; attended with violent struggles, or tranquil: also the nature of the preceding disease, and the state of the other organs of the body. We may thus ascertain whether the venous system is generally congested or not; and it should be remembered that the parenchymatous and membranous organs are usually found gorged with blood after disease of the heart and asphyxia, in consequence of the mechanical obstruction to the return of blood to the heart.

It is important, however, to remark that the morbid appearances indicating active or passive congestion, such as redness, injection, turgescence, and even slight effusions, which existed during life, sometimes completely disappear after death. There can be no doubt that this may happen, because there are instances in which, although the skin or the eye presented some of these appearances during life, they have been found quite pale after death. When, therefore, there have been well-marked symptoms of congestive disease during life, the absence of the usual morbid appearances after death is not always sufficient to destroy our belief in their existence. We know that nothing may be found in the brain after apoplexy from simple congestion, though such cases are not of frequent occurrence. The changes of structure induced by true inflammation, such as suppuration, ulceration, &c., are free from this source of deception.

3. A little attention will be sufficient to distinguish the cadaveric congestions arising from mere gravitation of the fluids, from those produced by disease; the vascular injection and redness is confined to the most dependent parts of organs, and is found in a number of organs at the same time, varying of course according to the position of the entire body, or of certain regions only; this should always be a subject of particular inquiry. A considerable degree of injection, therefore, confined to one organ, and especially not occupying its most dependent part, may fairly be attributed to disease. The redness, injection, and sanguineous or serous infiltrations resulting from transudation, occur at a later period after death; the tissues are of a uniform red, as if dyed with blood; the blood can sometimes be washed away by repeated ablution, or by maceration for some hours in water; but this will not be the case four or five days after death. If a considerable degree of sanguineous infiltration is observed in one organ only, some days after death, and if it be accompanied particularly with much injection of both its large and small blood-vessels, there is little doubt but that it is the effect of disease; but if similar appearances exist also in different other parts of the body, it is much more probable that they originate in the cadaveric transudation that attends putrefaction. There is frequently, however, great difficulty in forming a right judgment in such cases, and it is necessary to exercise the utmost caution and discretion on this subject when called upon to give evidence before a court of justice. The various appearances depending on the action of chemical affinities in a more advanced state of putrefaction, are too well characterized to deceive any well-informed observer.

In judging of the morbid appearances, it will be necessary to take into consideration:—1. the period at which the body is examined; 2. the position of the part; 3. whether there existed any mechanical obstruction to the circulation during life; 4. the mode of death; 5. whether there were any symptoms of acute vascular disease during life.

Local Symptoms of Inflammation.—Inflammation has been described both by ancient and modern writers as characterized by four local symptoms. These have been accurately noticed by Celsus: *notæ vero inflammationis sunt quatuor—rubor et tremor cum calore et dolore* (Lib. iii. cap. 10.) These symptoms may not all exist in every case, but the greater number of them are usually present; they may assume also various respective degrees of intensity. In some tissues there is generally very little redness or swelling, but intense pain. The pain may be intense, although the inflammation is moderate, or the pain be slight and the swelling considerable. The heat also varies in the same manner, the inflammation being sometimes attended with little increase of heat, while the swelling is great. These four symptoms exist in a moderate degree in the first stage of the inflammatory process, sometimes described as subacute, and which we have distinguished from perfectly developed inflammation by the term *active congestive* or *congestive irritation*. It is only when these symptoms have acquired a certain degree of intensity, leading to morbid changes of structure, that they constitute, according to the view we have adopted, true inflammation.

Redness.—Some tissues are naturally red; their redness, therefore, must be preternaturally increased to become morbid. A quickened circulation may cause a temporary increase of redness, heat, and even swelling, which soon subsides, and is in this case only physiological; the increase of redness must therefore be permanent to be accounted morbid. The redness is manifestly owing to the increased quantity of blood in the diseased part distending the vessels, and penetrating into the minute vascular ramifications which previously conveyed only colourless blood. Mr. Hunter froze the ear of a rabbit and thawed it again; this occasioned considerable inflammation, an increased heat and thickening of the part: this rabbit was killed when the ear was in the height of inflammation, and the head being injected, the two ears were removed and dried; the uninflamed ear dried clear and transparent, the vessels were distinctly seen ramifying through its substance; but the inflamed ear dried thicker and more opaque, and its arteries were considerably larger. The redness sometimes partly depends also on the formation of new vessels, but this of course can only happen in advanced stages of inflammation. Preternatural redness alone is not sufficient to constitute inflammation; it must be accompanied with a certain degree of pain, heat, and swelling; for we have seen that it is a common attendant of congestions, active, passive, and cadaveric. Its intensity is very variable; some dense fibrous tissues, such as tendons and ligaments, exhibit very little redness when inflamed, having but few vessels; whilst in more vascular textures the redness is bright and florid, constituting one of the most prominent symptoms; as, for example, in some cases of cynanche maligna, in which the pharynx and tonsils are of an intense fiery red with burning heat and pain, in consequence of the extreme injection and distension of the minute vessels; when the blood, however, stagnates, the redness changes to a dark purple, indicating mortification. The same appearances are observed in gangrenous erysipelas. The redness may assume various tints, from a bright scarlet to a dark livid purple, with every intermediate shade. It may also appear in patches, stripes, streaks, or be uniformly diffused; it is generally greatest in one point, decreasing gradually as it extends, until it becomes imperceptible, or sometimes terminating abruptly. It may be made to disappear by pressure, but returns as soon as the pressure is removed.

Swelling.—The swelling is produced in the first stage of inflammation by the greater influx of blood; at a later period it is increased by the effusion of serum, the extravasation of blood, and the deposition of coagulable lymph or pus; the interruption of the absorption may also be noticed as one of its causes. The swelling often remains after the inflammation has disappeared, particularly when it has induced much change of structure. Swelling alone does not constitute inflammation; although one of its symptoms, it may be occasioned by many other causes, such as the displacement of a part, as in hernia, and the dislocation of a bone, by the effusion of blood or water, the accumulation of air, morbid growths, &c. To be inflammatory, it must be conjoined with pain or redness. The degree of swelling depends partly on the violence of the inflammation, and partly on the structure of the parts affected; there sometimes exists very little swelling, as in ophthalmia, and superficial inflammation of the mucous and serous membranes, and also of the skin; the swelling is then irregularly diffused over a large surface; in other textures it may be considerable and circumscribed. Excessive swelling and redness in a part, without much heat or pain, is very likely to terminate in gangrene.

It is sometimes not easy to ascertain the existence and exact seat of swellings of the internal organs, particularly in the abdomen; and a considerable degree of habit and tact is generally required to avoid mistakes. The swelling may be fixed or movable, pulsatile or not; it may be necessary to make the patient vary his position, or to lessen the fulness of the abdomen by emptying the bowels; the exact seat of the swelling also is to be considered, whether connected with the liver, stomach, bowels or kidneys; situated in the mesentery, or merely in the abdominal parietes. A solid tumour sometimes pulsates in consequence of being in contact with the aorta; this must not be mistaken for aneurism. It is very important to remember accurately the natural relative position of the different organs; the same rule applies to the protrusion of tumours through the parietes of the thorax.

Whilst on the subject of swelling, we must notice the accompanying changes in the consistence or density of the part. Some pathologists have advanced as a general proposition, that inflammation has the effect of hardening soft and softening hard textures, giving as an instance the increased firmness of hepatized lung, and the softening of inflamed bone. We conceive, however, that there is some inaccuracy in this statement, owing to the ideas attached to the terms in which it is expressed not being well defined. Almost all soft parts of the body feel harder to the touch at the commencement of inflammation, in consequence of the distension produced by a greater influx of fluids; but this increased firmness of the part is far from indicating any increase in the force of cohesion of its particles, or a real augmentation of density. A portion of hepatized is much more friable and easily broken down by pressure than sound lung, which, although more yielding to the touch, has a greater degree of elasticity and power of resistance. It is more correct, therefore, to say that recent inflammation has the effect of lessening the force of cohesion of all parts of the body, both hard and soft. This remarkable property of inflammation will be fully considered in the article SOFTENING. When soft parts have been exposed to chronic inflammation, they often become hardened in consequence of new concrete products being deposited in their texture, or of its undergoing some change of structure by a slow and vitiated process of nutrition and secretion, as is exemplified in a variety of indurated tumours and morbid growths; in phlegmasia dolens; a peculiar form of hardening of the subcutaneous cellular tissue, and elephantiasis.

Heat.—The application of the hand to an inflamed part is sufficient to prove that its temperature is increased; the air expired, when the nostrils, throat, or bronchial membrane are inflamed, is so heated by passing over the inflamed parts as to feel burning. The sensations of the patient also indicate an increase of heat, although this is generally exaggerated, in consequence of the morbidly increased state of the sensibility; in some nervous affections the patient complains of a sensation of burning heat, whilst the temperature of the part remains natural or is even diminished; there is sometimes a sensation of burning heat in gangrene, when the part is quite cold. The natural temperature of the body varies from 98° to 100° at the heart and on the trunk, but it gradually decreases as we proceed further from the heart, and as the parts become smaller and more exposed to the influence of the surrounding atmosphere; it is thus only 92° at the extremities of the body: this is a fact it will be important to remember in forming any estimate of the increase of heat in inflammation. Mr. Hunter concluded, from experiments he made, that the temperature of inflamed parts is but little augmented; he excited artificially inflammation in the chest, the abdomen, the rectum, and the vagina, without being able to discover any great increase of temperature, the thermometer rising only to 101°; in one case, however, it was as high as 104° in the abdomen; and in a case of hydrocele the heat of the tunica vaginalis, which was 92° at the time of performing the usual operation, rose to 98° after inflammation had come on. There must, we think, have been some source of error in these experiments, for in numerous experiments made since those of Hunter, the thermometer, when applied to inflamed parts in cases of erysipelas, phlegmonous swellings, &c. has been observed to rise as high even as 107° of Fahrenheit. It is well known also that the general temperature of the body may be very considerably increased in various states of disease, not always inflammatory. When making observations to ascertain the variations of temperature in fever, we have not unfrequently seen a thermometer placed in the axilla, or under the tongue, rise as high as from 105° to 107°: a similar elevation of temperature has been noticed in acute rheumatism, and during the convulsions of tetanus. There is generally a rise of temperature with any great local increased activity of the circulation. Sir E. Home observed the oviduct of a frog, when about to spawn, two degrees higher than the temperature of the heart. Dr. Granville states that, during parturition, he has occasionally found the temperature of the vagina rise to 120°, the elevation appearing to bear a proportion to the degree of action in the organ. (Phil. Trans. for 1825, p. 262.) Every preternatural increase of heat is not therefore to be considered as inflammatory. In cases of fever, and especially of hectic fever, the whole body, or certain regions, such as the cheeks and the extremities, may be of a burning heat for a considerable time, in consequence of a state of active vascular congestion, without any inflammation. There must be a certain degree of intensity and a certain duration of morbid heat, united with other symptoms, to constitute inflammation. Redness and swelling may also exist with very little heat or pain, and pass on to suppuration, as is the case in abscesses by congestion and other forms of chronic inflammation.

We can scarcely expect that any satisfactory explanation of the increase of heat in inflammation will be given as long as there are points in the theory of animal heat that remain involved in obscurity. As the variations of animal temperature constitute one of the most important morbid phenomena of inflammation, and of many other diseases, the consideration of the various opinions that have prevailed respecting the source of animal heat, and the causes which regulate its variations in disease as well as in health, is a subject of peculiar interest to the pathologist.

The *chemical* theory of animal heat proposed first by Dr. Black, and greatly improved subsequently by Dr. Crawford, (Experiments and Observations on Animal Heat, &c. by Adair Crawford, M.D., F.R.S., L.& E., &c.,) was long considered to account in a perfectly satisfactory manner for all the varied phenomena of animal temperature, both in health and disease. The accuracy of this theory has, however, been called in question of late years by several able physiologists, who have drawn conclusions from their experiments tending to subvert every one of its main positions. The chemical theory assumed as fundamental facts, 1st, That the generation of heat in animals is the immediate effect of the chemical action of the air upon the blood in the lungs, leading to results strictly analagous to those of ordinary combustion: 2d, That oxygen and arterial blood have much greater capacities for caloric than carbonic acid and venous blood; 3d, That the temperature of the blood is the same on both sides of the heart, and in the large trunks of the pulmonic system; and that the evolution of heat throughout the body is the result of the capacity of the arterial blood for caloric becoming lessened when it is changed into venous, by which a portion of its *latent* caloric is set *free*.

The important fact of oxygen having a much greater capacity for caloric than carbonic acid has been denied by Delaroche and Berard; and the fact of the capacity for caloric of arterial blood being greater than that of venous has been disputed also by Dr. Davy. The experiments, however, for estimating the capacities of gases and fluids for caloric are of so delicate a nature, and liable to so many sources of error, that the conclusions of these two gentlemen are by no means considered as fully proved. It has been asserted also, as the result of numerous experiments, that the heat of the blood on both sides of the heart is not uniform, but that the arterial blood is warmer than the venous by one or two degrees: it must be acknowledged that this opinion seems to have a great weight of evidence in its favour.

The experiments, however, which would have most completely overthrown the *chemical* theory, if their conclusions had been confirmed, were those of Mr. Brodie; they led to the conclusion, by maintaining artificial respiration in decapitated animals, that the generation of heat has no connection whatever with the changes the air and blood undergo in the lungs, but is entirely dependent on the influence of the brain and nervous system. (Phil. Trans. for 1811, p. 37; also Phil. Trans. for 1812.) Legallois having, however, performed experiments of a similar description, arrived at conclusions directly opposed to those of Mr. Brodie, and tending strongly to confirm the opinion of the evolution of heat always bearing a relation to the consumption of oxygen. (Ann. de Chim. et Phys. tom. iv. p. 5. 113.)

The inaccuracy of Mr. Brodie's conclusions was further clearly established by the investigations of Dr. W. Philip, who pointed out several important sources of error in his experiments. While, however, it is admitted by Dr. W. Philip that the action of the air upon the blood in the lungs is the great source of animal heat, he has been led to conclude by some ingenious experiments, that its extrication from the blood throughout the system depends on the direct action of the nervous influence on the blood, and that the generation of heat may therefore be regarded as a kind of secretion.*

The advocates of the chemical theory have differed with respect to the part of the animal economy in which the combination of the oxygen of the air with the carbon of the blood takes place. Dr. Crawford maintained that the carbonic acid is formed in the lungs; that the heat evolved by its production is absorbed and becomes latent in consequence, as before mentioned, of the great capacity for caloric of arterial blood; and that it is again set free on the blood being changed into venous. Legrange and Hassenfratz conceived that the air is absorbed by the blood in the lungs, and that the combination of its oxygen with the carbon of the blood takes place in the course of circulation, leading in this way to a gradual evolution of heat. Dr. Edwards has adopted this opinion, and supported it by experiments which appear extremely conclusive. Mitchell and Faust, however, having lately made in America some highly interesting experiments on the *endosmosis* of gases, consider that they have ascertained, beyond all doubt, that the carbonic acid is generated in the lungs. (American Journal of Med. Sciences, vol. vii. Philad. Nov. 1830.) If it be true, as stated by some able chemists, that the most delicate analysis can detect no carbonic acid in venous blood, this would at once prove fatal to the opinion of Legrange.†

On the whole the weight of evidence seems to be still greatly in favour of Dr. Crawford's theory; and although doubts may have been thrown out on the accuracy of some of his fundamental conclusions, none of them have yet been successfully controverted. It appears highly probable that no theory can ever be established without a due reference to the connection which respiration has with the production of animal heat. It must, in the mean time, be admitted that the temperature of a part is not always in proportion to the strength and rapidity of its circulation, and that there are other circumstances, not hitherto well understood, by which the phenomena must to a certain extent be influenced: this is particularly the case with respect to the circumstances that influence the extrication of heat, and regulate the ever-varying changes of temperature in different parts of the body. In some cases, for instance, of gouty inflammation, the heat of the part feels extremely pungent to another person, although there is not the least symptom of any increased influx of blood; the heat of the surface of the body is very high in some nervous fevers in which the vascular action is only moderately increased. Dr. Hastings states that he has seen several cases of fever in which the circulation was even remarkably slow, the pulse being only 45, when the temperature of the body was 105°; and that the heat has also been 100° in cases of hydrocephalus, with a pulse at 60 or 70. (Hastings on Inflammation, p. 110.) There is great reason to believe that the influence of the nervous system over the evolution of heat throughout the body is very considerable, especially in some states of disease; and if this be a well-founded conjecture, it would enable us to explain in a perfectly satisfactory manner several of the phenomena of this interesting process, which cannot so well be accounted for on chemical principles.

There is one circumstance, besides chemical action, which must, we conceive, have a considerable degree of influence in modifying the animal temperature, and which appears to us to have been hitherto too much overlooked. The various materials of which the body is composed are undergoing, during the process of assimilation, disassimilation, and secretion, an incessant change of state; some passing from the gaseous to the fluid, and from the fluid to the solid state, whilst others experience similar changes in an inverse order. These variations of density must necessarily be attended with both a considerable extrication and absorption of caloric, partly, no doubt, under the influence of chemical and electro-galvanic agency. It is, therefore, reasonable to suppose that the diffusion of animal heat throughout the body is in some measure connected with the operations, physical, vital, and chemical, constantly going on in the extreme vessels; and we shall probably never be able to construct any perfect theory of animal heat until we are better acquainted with the functions of these vessels. It is well known that every material disorder of the functions of nutrition and secretion modifies the temperature of the body: when the powers of assimilation exceed those of disassimilation, and the function of nutrition is in great activity, the faculty of producing heat is considerably increased; while, when the waste of the body surpasses its nutrition, the faculty of producing heat is weaker. Thus, in healthy individuals in the prime of life this faculty is greater than in old and sickly people; this is likewise exemplified by the cooling effects of the evaporation of the cutaneous perspiration, and, in dogs, of the pulmonary exhalation. In inflammation there is a great accession of nutritive fluids, which, becoming condensed, necessarily give out heat, whilst absorption and disassimilation are completely suspended; this must inevitably create a considerable preponderance in the extrication of heat over its absorption, and contribute to raise the temperature of the part.

Dr. Edwards has adopted the conclusion, from his beautiful experiments *On the Influence of Physical Agents*, that the production of animal heat is to be referred to a special power possessed mation of the larynx with a shrill, crowing, hoarse, or feeble voice, and difficulty of breathing; that of the pharynx with difficult deglutition; that of the lungs with dyspnœa, cough, and various kinds of expectoration; hepatitis with pain in the shoulder and larynx, besides pain, heat, and fulness in the right hypochondrium; gastritis with nausea and vomiting, besides fulness, heat, pain, and great tenderness in the epigastric region; nephritis with retraction of the testicle and vomiting; panaris with swelling of the glands of the axilla, &c. When the inflammation affects exhaling and secreting organs, there is a change in the quantity and quality of the secretions; they are at first diminished, or even suspended; they then return altered perhaps in colour, thickness, or smell.

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* It has been ascertained by Prevost and Dumas, from some very valuable experiments upon the proportional quantity of globules contained in the blood of different kinds of animals, and of different parts of the sanguiferous system in the same animals, that there exists an exact ratio between these globules and the temperature of the animal, which is highest in those whose blood contains the largest proportion of globules.

† A good account of the various opinions brought forward on the subject of animal heat, and of their respective merits, will be found in Dr. Bostock's valuable Elementary System of Physiology, vol. ii. p. 243.

In the inflammation of internal organs these functional and sympathetic symptoms are often of the greatest value, as the more ordinary local symptoms are mostly beyond the reach of our observation. When the inflammation is extensive and severe, the functions of other organs are also disturbed: the whole constitution may become more or less affected; and this affords another class of symptoms called *constitutional*, from which we often derive considerable assistance in our diagnosis. These form the next subject of consideration.

[From the whole consideration of the subject, we are justified in embracing the views of a recent able writer, (Alison, in Tweedie's *Library of Medicine*, 2d edit. vol. i., Philad. 1843; see, also, his *Outlines of Pathology and Practice of Medicine*, Amer. edit., Philad. 1844): "In order," he remarks, "to give the requisite precision to the general notion of inflammation, as a local change of the condition of any part of the body, it seems only necessary to include in it, besides the pain, swelling, heat and redness, the tendency always observed, even when the changes in question are of short duration, to effusion from the blood-vessels of some new products, speedily assuming, in most instances, the form either of coagulable lymph or pus. It is true, that there may be inflammation either of so slight intensity, or short duration, as never to show these, its usual consequences; but we shall escape a great deal of useless verbal discussion and misapprehension if we lay it down as a rule, never to apply the term except in cases where we are satisfied, that the tendency to these effusions exists, and that, if they do not appear, it is only because of the minute scale, or the rapid abatement of the diseased action. A peculiar perversion of nutrition or of secretion, we hold to be essential to the very existence of inflammation; and all descriptions, and all attempts at explanation of the changes to which the term is applied, if they do not include this, their most essential peculiarity, we must regard as necessarily and fundamentally defective."]

Constitutional Symptoms of Inflammation.—It has already been stated in the experimental inquiry into the nature of inflammation, that the action of stimuli on the living body was not always limited to the part to which they were applied, but extended frequently to the whole animal economy, exciting various degrees of disturbance in its several functions. The existence and nature of this constitutional derangement were demonstrated by several experiments.

Inflammation may extend in several ways beyond its original seat. By continuity:—when it extends along the surface or throughout the substance of the same tissue: thus there is a great tendency to the rapid diffusion of inflammation along the surface of the skin in erysipelas; and the same is observed in the inflammation of mucous, serous, and fibrous membranes. By contiguity:—when it is communicated to adjacent tissues of a different nature: the inflammation often extends in this manner from serous membranes to the organs they invest. The facility with which inflammation spreads by contiguity depends, in a great measure, on the disposition of the connecting cellular membrane: when loose, it transmits the inflammation rapidly from one part to the other; but when dense, it appears to oppose strongly the propagation of the disease. It was a remark of Laennec, that congestions and gangrene had a greater disposition to spread by contiguity, and acute inflammation by continuity.

The local extension of inflammation is, on the other hand, checked by differences in the texture, the vital properties, and in the functions of the various organs and tissues of the body; and we may add, that general tendency in all living matter to resist the destructive effects of disease. One of the means by which this is effected is the effusion of coagulable lymph, and contraction of adhesions around the seat of the inflammation; so that the continuity of the parts is interrupted, and the disease circumscribed.

The communication of inflammation to parts of the body *remote* from its original seat takes place in two different ways, either through the medium of the circulation, or that of the nervous system. It has been satisfactorily proved, by direct experiment, that when deleterious substances are inserted into any part of the body, they are sometimes absorbed into the blood-vessels, and conveyed by the blood to remote parts, where they excite various diseased actions. (Magendie's Physiology, p. 347, Milligan's translation.) We have further demonstration of this being the case from numerous pathological facts, as in the morbid effects of various animal and other poisons, which it would be difficult to explain in any other manner than by the absorption of the morbid matter. It is, therefore, very generally admitted that the blood is the vehicle of a great many morbid principles; and that the deterioration of its qualities is to be placed among the most frequent causes of disease. In inflammation it is easy to conceive, when it is either of an unhealthy character or the result of a specific cause, how the morbid products of the local affection, being absorbed into the blood and circulated with it throughout the body, should sometimes excite inflammation in distant organs and disturb the general health. Morbid impressions are, however, transmitted also from one part to another by the nervous system; and nervous sympathy is therefore another great cause of the constitution being so frequently and variously affected by local inflammation. We think it, therefore, desirable to offer here a few observations on the influence of sympathy.

The structure of the human body is very complicated, its elementary materials being so arranged as to constitute an assemblage of tissues and organs having distinct physical and vital properties; these tissues and organs act reciprocally on each other, producing by their combined operations the complex phenomena of life. Every living part of the body has a general sympathy with the whole system, or a particular sympathy with certain parts of it; and the functions of each part are more or less essential to the healthy action of the whole. The influence of these reciprocal sympathies is, therefore, very considerable, especially in disease. It is through the medium of the brain and nerves that sympathies are established between all parts of the system; receiving morbid impressions from diseased parts, the nerves transmit them to the other organs of the body, and in this manner become the source of an infinite variety of both local and constitutional morbid phenomena.*

Inflammation in one part of the body may also disturb the functions of the others by its direct influence on their circulation, independently of any nervous sympathy. The great accumulation of blood in an inflamed part may be the means of depriving another of its usual supply of blood; thus the inflammation of internal organs attracts sometimes the blood from the surface towards the centre of the body, creating coldness and pallidness of the skin; the lower extremities are likewise cold in cases of determination of blood to the head; on the other hand, if the regular return of the blood to the heart be prevented by the inflammation of any of the central organs, such as the lungs, heart, large vessels, &c., this will cause it to accumulate in remote organs, and impede their functions. These unequal distributions of blood from the mere mechanical derangement of the balance of the circulation are of frequent occurrence, and a much greater source of constitutional derangement than has generally been supposed: they may be looked upon as a species of *sanguineous* sympathy.

There exists a strong sympathy also between the different organs engaged in the same function: when the stomach, for instance, is in a state of disease, all the other organs belonging to the digestive function are more particularly predisposed to sympathize with it. One eye has also been known to become inflamed through mere sympathy with inflammation that existed previously in the other. This kind of sympathetic influence has been called *sympathy of function*. It has been advanced by Bichat that similarity of structure chiefly is a great source of sympathy, and that, for example, when a serous or fibrous membrane or a muscular organ was inflamed in one part of the body, there was a strong tendency to inflammation of the same texture in every other part of the body.

The various morbid sympathies and constitutional symptoms to which they give rise, are considerably modified by those peculiarities of constitution which have been termed temperaments and idiosyncrasies. The temperaments are formed by a preponderance in the development and activity of certain tissues over others in the same body; they may be divided, to suit practical purposes, chiefly into four—the sanguineous, bilious, phlegmatic, and nervous; there are, however, various combinations of these, forming a number of subdivisions. By idiosyncrasies are meant peculiarities of constitution belonging only to one or a few individuals; these are innumerable, often discovered only by accident, and in general difficult to explain. Thus certain alimentary and medicinal substances affect some individuals in a manner totally opposite to their general mode of action. There are also predispositions of the constitution to certain forms of disease, which are called *diatheses*. Having premised these general observations on the different modes of extension of inflammation on sympathetics and temperaments, we shall proceed to the important consideration of, 1st, the influence of the constitution on local inflammation; and, 2dly, of the various forms of constitutional derangement induced by inflammation.

Influence of different states of the Constitution on local Inflammation.—We have already had occasion to remark, that every living part seems to be endowed with an inherent faculty of resisting, to a certain extent, the effect of disease. We are unacquainted with the nature of this faculty: it cannot be satisfactorily accounted for by structure, and is to be referred most probably to the immediate influence of the vital principle; it has been designated accordingly by the ancients *vis medicatrix naturæ*. It is in consequence of this faculty of resistance, that whenever a living part has sustained any injury, either from external or internal causes, an increased activity is soon observed to take place in most of its vital actions, and a process *essentially vital* is set up, by which the effects of the injury are often prevented, removed, or repaired.

The faculty of resisting disease is observed to exist in different degrees in different individuals, and in the various parts of the same body. It is generally greater or less in proportion to the strength and soundness, or weakness and unsoundness, of the constitution. In strong and healthy constitutions, there is in general only moderate predisposition to inflammation, even after the severest injuries, which are repaired by a mild though efficient degree of inflammatory action. But in individuals whose constitutions are either originally weak, irritable, or unsound, or have been rendered so by long-continued disease, the tendency to resist inflammation is much weaker, and when excited, it is generally more violent, spreads more rapidly, and is less easily removed. It is also well known that parts of the body having a low vitality, such as tendons, ligaments, bones, &c., resist inflammation much less effectually than those more highly organized. It is highly important, therefore, in a practical point of view, to remember that there are circumstances in which the violence and spreading of inflammation may be greatly increased by a state of general debility.

A disordered state of the constitution operates not only in favouring the increase of inflammation, but opposes also a formidable obstacle to the establishment of those restorative processes by which it is brought to a favourable termination. The principal sources of disorder in the constitution by which local inflammation is liable to be affected, may be referred to the following: a state of general plethora combined with an over-degree of activity in all the functions of life—an opposite condition of the system arising from deficient nourishment, and attended with general languor and debility—the vitiation of the qualities of the blood and other animal fluids, the effect either of bad food and air, or of the introduction into the animal economy of morbid and other deleterious substances—a disturbed and irritable condition of the nervous system—a disordered state of the digestive function, and that in general of any of the vital functions—organic disease of an important organ—and, lastly, a predisposition to some form of specific disease, such as scrofula, gout, cancer, &c. Innumerable examples of the influence of all these morbid conditions of the constitution upon local inflammation might easily be adduced, were it not incompatible with the limits of this article; but we shall have occasion to enlarge upon this view of our subject when treating of the constitutional effects of inflammation.

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* See Dr. Thomson's account of particular sympathies in his Lectures on Inflammation, and also some excellent remarks on the influence of local and general sympathies in the work on inflammation by Mr. James, second edition.

There is one highly important practical rule to be deduced from the preceding considerations, namely, that from whatever cause the disorder of the constitution may proceed, the attention of the practitioner must be first directed to the amendment of the general health before he can hope to succeed in removing the local disease; this latter must in fact be treated by constitutional remedies; for if local applications only be relied upon, they will seldom be treated by constitutional remedies; for if local applications only upon, they will seldom be found of much avail. The merit of having called the attention of the profession to this important principle in pathology, is due, as already observed, to the late Mr. Abernethy, who directed more especially his inquiries to the influence of the state of the digestive organs over local diseases: we must refer the reader for fuller details on this important subject to Mr. Abernethy's valuable writings. (On the Constitutional Origin of Local Disease.)

Various Forms of Constitutional Disturbance Induced by Inflammation.—Inflammation of any parts of the body, whenever it is very intense, excites a disturbance in the functions of the heart, brain, and stomach, characterized by a series of morbid phenomena which have received the name of *symptomatic* or *sympathetic fever*. This morbid state of the constitution reacts, however, powerfully in its turn on the local inflammation by which it has been excited, so that there exists the most intimate connection between the local affection and constitutional reaction. This is a circumstance leading to highly important consequences, for the sympathy of the constitution is generally the result of a salutary effort of the powers of life to assist in arresting the progress or removing the effects of the local disease, and the accomplishment of this desirable end depends in great measure on the local and constitutional morbid actions being duly balanced.

Many proofs can be adduced in support of this mutual dependence of the local and constitutional affection upon each other. The reaction of the constitution corresponds generally in degree with the strength of the local inflammation, the former being aggravated or diminished in the same proportion as the latter increases or lessens. When the reaction is excessive, it tends to aggravate the local disease: when, on the contrary, the reaction is deficient, the local affection may either remain stationary and assume a chronic character, or it may increase rapidly, and affect by sympathy remote parts of the body, as sometimes happens in the unhealthy inflammation excited by morbid effluvia or animal poisons. It is well known that if the constitution becomes much disordered, or if its powers happen to fail during the progress towards restoration of any wound, the inflammation of the wound, which was before perfectly healthy, either assumes immediately an unhealthy character, or entirely disappears, leaving the part even sometimes in a state of mortification. The discharge from a wound, moreover, is generally scanty, and never of a healthy character as long as the symptomatic fever continues high; but as soon as the fever abates and the general secretions are restored, the discharge becomes more copious and healthy. If, on the other hand, an individual reduced to a state of extreme debility from severe local disease, be seized with inflammation of a vital organ, he will sometimes bear with impunity a degree of general depletion which would have been previously sufficient to destroy him. (James on Inflammation, p. 46.) The preceding instances, to which many others could easily be added, will be sufficient to establish the fact of the existence of the closest sympathy between the local and constitutional morbid actions.

The constitutional reaction not only varies as already stated, in degree, but also in its nature; and the correspondence is likewise maintained in this respect between the local and constitutional affection. The character or type of the symptomatic fever is influenced chiefly by the following circumstances in the temperament and previous state of health of the individual,—the seat and extent of the local affection, and the nature of the exciting cause. In individuals of a sanguineous temperament there is generally a strong reaction of the vascular system, and the type of the fever is essentially *inflammatory*, and seldom attended with much danger. In those of a nervous and irritable temperament, or whose constitutions have been weakened by disease, the fever is chiefly characterised by considerable disturbance of the *nervous system*, and by a variety of anomalous and untoward symptoms; there is frequently in this form of fever a degree of over-excitement followed by rapid collapse. The character of the reaction, however, may be entirely derived from the seat and extent of the inflammation, or the nature of the exciting cause: thus the inflammation of fibrous tissues, that consequent upon extensive injuries, or poisoned wounds, &c., generally induces very great disturbance of the nervous system, and the most dangerous forms of sympathetic fever, even in robust and healthy subjects. It is worthy of remark in these cases, that whenever we can change the character of the local disease by substituting healthy for unhealthy inflammation, the character of the constitutional affection becomes also immediately impaired.

There is another important form of constitutional affection that differs widely from the preceding; it is characterized by the total absence of all reaction, and by a state of direct prostration and rapid sinking of the powers of life; this dangerous affection may also depend either on the temperament and previous state of health, the seat and extent of the local affection, or nature of the exciting cause.

The constitutional symptoms present other variations with respect to their character or the order of their appearance; they may be remittent or intermittent; precede the appearance of the local symptoms, occur simultaneously, and sometimes only after them. The character of the fever may be modified by the inflammatory and nervous types being combined in an almost infinite variety of degrees. It would be impossible, however, to describe every shade of difference; and we think it sufficient therefore for practical purposes, to adopt the division of the constitutional affections into, 1st, *inflammatory reaction*; 2d, *nervous reaction*; and 3d, *the state of direct prostration and rapid sinking without reaction*. We must be understood not to use the terms inflammatory and nervous in an exclusive sense, but as only implying that such is in each case the predominant nature of the reaction.

1. The appearance of the constitutional as well as of the local symptoms does not always immediately follow the introduction of a morbid agent into the system; a period of variable duration often intervenes, which may be considered as one of *incubation*. This important period is sometimes characterized by a certain degree of constitutional derangement; the symptoms of this derangement being, however, obscure, have not hitherto obtained the attention they perhaps deserve, and are often unnoticed both by the patient and the practitioner. There may be a feeling of general uneasiness and lassitude; pains in the limbs, disturbed sleep, sometimes headach, depression of spirits, slight alternations of chill and heat, a decrease of appetite, a bitter taste, clammy and furred tongue, a tendency to constipation, and turbid urine: other symptoms, besides the preceding, might no doubt be sometimes detected by close observation; they all indicate the latent influence of some morbific cause, acting on the entire system, and depressing more especially the functions of the circulation and innervation.

After the period of incubation has lasted a variable interval of time, the local symptoms of inflammation generally make their appearance; and these are followed sooner or later by a more marked degree of constitutional disturbance. The patient is seized with rigor, nausea, or vomiting; the face is pale, the skin cold and rough, the pulse small and frequent: to this depression succeeds a general reaction, characterized by a dry burning heat of the skin, headach, flushing of the face, pain in the loins, restlessness, great general anxiety, soreness of the whole body, and sometimes delirium. The pulse is full, hard, and frequent; the breathing hurried; the secretions become diminished and altered; the tongue is furred, dry, and red, especially at the edges and point; there is loss of appetite and great thirst; the bowels are confined; the urine is scanty and high-coloured, but it remains clear and emits a strong animal smell. The blood drawn from the veins is buffed and cupped, a state of the blood which has already been fully described. These symptoms vary in severity and duration according to the seat and intensity of the inflammation.

In all inflammatory affections there are also daily variations in the acuteness of the symptoms, constituting paroxysms of exacerbation and remission. The exacerbations generally occur towards night, when there is an increase of the pain, heat, and swelling, and an exasperation of all the febrile symptoms. As the morning approaches, the symptoms lessen in severity, and there is either a partial or complete remission of fever, characterized by an abatement of the pain, and frequency of the pulse, and by the breaking out of moisture on the skin.

Besides these daily variations, the course of inflammatory affections may be divided into three periods—one of invasion, one of increase, and one of decline. The febrile symptoms already described persist, varying only in intensity, until the inflammation has reached its height. During the period of decline they are variously modified according to the mode of termination of the local disease: if by resolution, there is a gradual abatement of the fever, attended usually with a restoration of the diminished secretions and critical evacuations from some of the excretory organs. Thus, as the local symptoms decrease, the frequency of pulse and heat of the skin gradually subside; the tongue becomes moist and clean; the thirst, restlessness, general pains, and delirium disappear; there is a variety of critical evacuations, by profuse sweat or a copious flow of urine; by diarrhœa, expectoration, ptyalism; or by spontaneous hemorrhage from the nose, stomach, bowels, kidneys, or uterus. These critical discharges occur either singly or are variously combined; they are frequently preceded by a severe general rigor and exacerbation of all the constitutional symptoms, *exacerbatio critica*, which is sometimes mistaken for an aggravation of disease, but is soon followed by profuse sweat and other evacuations, which lead to a complete remission of the fever. The variations in the state of the urine deserve particular attention; a full account of them will be found under the section *Resolution*. The ancients attributed these critical evacuations to the expulsion of the morbific matter, by which blood and humours were deprived of their inflammatory and other deleterious properties; and they considered them as being strictly analogous to the suppuration of phlegmon.

When, however, the inflammation terminates in suppuration, there is during the period of decline an imperfect remission only of the constitutional symptoms; the fever returns after a deceitful suspension or partial abatement of its symptoms for a few days. It assumes a more decidedly remittent character; slight paroxysms of rigor are experienced towards evening or after the meals, followed by flushes of heat, particularly in the cheeks, hands, and feet; also thirst, restlessness, and frequency of pulse; the exacerbation increases until towards morning, when it is relieved by profuse perspiration, and there is a well-marked remission of fever during the forenoon; this constitutes *hectic* fever, which has been fully described in the article **Fever.**

The sudden cessation of violent pain attended with prostration of strength, increased rapidity, weakness and irregularity of the pulse, cold clammy sweat and delirium, denote the fatal termination by gangrene.

It is important to observe, that when the period of increase of the inflammation has been attended with high general excitement, that of decline is sometimes marked by a great and dangerous collapse of the powers of life, particularly in old people and young children. The probability of such an occurrence should be carefully kept in view, in prescribing active remedies during the violence of the disease in such subjects; for otherwise a state of fatal sinking or dropsical effusion may be brought on by too active a treatment, although it may perhaps have appeared justified at the time by the immediate relief it afforded. If old people were formerly stimulated to death under the mistaken notion that they are not subject to inflammation, we suspect that some in the present day may have sunk under the indirect effects of excessive bleeding, owing to a disregard of the practical precept just alluded to.

The series of constitutional symptoms we have just described are those of the simplest form of inflammatory fever. This fever is generally induced by the development of common acute inflammation from either accidental or constitutional causes; it affects most commonly robust healthy individuals, of a sanguine temperament, in whom there is a redundancy of rich blood—a condition of the system which has received the name of inflammatory diathesis. The simple inflammatory fever may be considered as a salutary effort, by which the general powers of the constitution are brought into action, in order to assist in relieving some part of the body from a state of disease, by which the harmony of the functions, essential to health, is more or less disturbed. The fever may itself become a source of danger, when too violent, by aggravating the primary disease, or by exciting inflammation in other parts of the body; or when, from deficiency of the powers of life, the fever of reaction is too weak, the local disease is sometimes only partially removed, and passes into a chronic state: a deficient reaction is thus frequently the cause of inflammation being followed by changes of structure, such as indurations and effusions.

2. There is a form of constitution directly opposed to the sanguineous: it is chiefly characterized by weakness and irritability of the nervous system, and called the nervous temperament. This condition of the system is very obnoxious to inflammation, which, when developed, runs a much more irregular and unpropitious course than in the sanguine temperament. The constitutional symptoms of inflammation in this temperament are, as already stated, rather characterized by disturbance in the nervous system than by strongly increased vascular action, and the fever generally assumes a nervous, typhoid, or ataxic type. Another peculiarity of constitution which often accompanies the former, is a vitiated state of the blood, whose qualities have become altered, in consequence, probably, of some disorder in the functions of nutrition or sanguification. The combination of these two conditions of the system gives origin to the very worst forms of symptomatic fevers, called adynamic or putrid, in which to the most formidable nervous symptoms are united an extremely vitiated state of the secretions, and a great tendency of the blood and other fluids to rapid decomposition. There is sometimes a combination of the inflammatory and typhoid or adynamic forms of fever, exhibiting symptoms of high vascular excitement with great deficiency of nervous power; this is a complication of disease attended with extreme danger, and requiring considerable tact and caution in its treatment.

The essential character of the irritability of temperament which predisposes to the preceding forms of constitutional derangement, is over-activity of the nervous system, combined with deficiency of the power of resistance. Irritability may be induced by deficiency as well as by excess of stimulus: a certain degree of stimulus is necessary to preserve the healthy tone of every living part: thus, if the retina be deprived of its natural stimulus by the long-continued exclusion of light, it becomes weak and irritable, and intolerant to that degree of light which was previously endured without inconvenience. An excess of stimulus, as in inflammation, produces exactly the same result. The stomach in the same way becomes weak and irritable by long abstinence from the use of meat and wine, and can only be brought back by slow degrees to tolerate even moderate quantities of stimulating food, as we see exemplified in convalescence after protracted acute diseases, and in all cases of long-continued starvation. When the privation of stimulus is carried beyond certain limits, instead of increased irritability, the sensibility becomes gradually weakened, until it is at last completely extinguished, and a state of torpor succeeds; the effect of long-continued over-stimulus is likewise to induce torpor, both extremes thus leading to exactly the same result. These illustrations of the opposite causes which may give rise to irritability, are susceptible of some important practical applications in the pathology of inflammatory diseases. There is no state of the constitution attended with so many complicated, obscure, and varied morbid phenomena, and so difficult to manage, as that which is characterized by either local or general irritability.

The irritability may be confined to one organ or to one function; it may be justly said that there is in every constitution some weak part more predisposed to disease than others; and this may be the result of original structure, or have been acquired by habits of life or previous disease.

In consequence of the great excitability of the nervous system in irritable habits, and want of power to sustain action, the sympathetic fever of inflammation is frequently characterized by a state of great over-excitement, followed by collapse. For example, the first effects of any serious injury or of the spontaneous development of inflammation in an irritable constitution may be a momentary state of depression, languor, or stupor. This, however, is, after a variable interval of time, succeeded by one or several paroxysms of rigor, sometimes very severe, which usher in the variable train of symptoms: nausea, vomiting, and great irritability of the stomach; a dry brown tongue, parching thirst, obstinate constipation, scanty and high-coloured urine; præcordial anxiety and great restlessness; rapid pulse, either bounding or small, contracted, and irregular; burning dry heat of the skin; oppressed hurried breathing with frequent sighing; flushed countenance; severe headach; contracted pupils and wild expression of the eyes; incoherence, amounting sometimes to fierce maniacal delirium, requiring restraint; convulsive paroxysm, with great distortion of the features, not unlike epilepsy. This state is followed by one of considerable exhaustion, characterized by somnolency; sunk, haggard, and livid aspect of the countenance; profuse chilly and clammy sweats; small, irregular, fluttering pulse, rapid sometimes beyond reckoning; panting respiration; passive convulsions; hiccup and subsultus; coma and stertor, terminating in death.

The symptoms do not, however, always present this extreme degree of violence, nor lead so rapidly to a fatal result; they frequently assume the form of mild typhous or adynamic fever, characterized at one period by restlessness, anxiety, some headach, occasional low muttering delirium, moderate heat of skin, and frequency of pulse; the skin is covered with petechiæ, the tongue black and dry, the alvine evacuations vitiated and fetid; whilst at another period there are stupor, chilliness, slight convulsions and subsultus, and the usual symptoms of collapse. These various forms of constitutional derangement are especially distinguished by a rapid alternation of symptoms denoting contrary states of the system, and they derive their essential character, as before observed, from a state of excitement not supported by sufficient vital power to maintain and carry it through.

In this general state of morbid irritability, very slight causes of irritation give rise sometimes to the most violent constitutional disturbance, so that the general symptoms are not always proportionate to the extent of the local inflammation, nor a sure criterion of the degree of danger; the pulse may rise to 160, the heat of the skin be very high, and all the other symptoms usually indicating dangerous inflammation of some important organ, may be occasioned by only a trifling wound or furuncle, slight inflammation of the tonsils, or rheumatism of a joint. It is necessary, therefore, in forming a prognosis, not to be guided entirely by the general symptoms, but to take also into account the seat and extent of the inflammation. At other times, however, the local affection takes upon itself the impress, as it were, of the constitution; the inflammation is either exasperated and spreads rapidly, or it is partially suspended, or there is a complete cessation of vital action in the inflamed part, which becomes cold, livid, flabby, and sometimes gangrenous: these unfavourable changes have been frequently observed in extensive wounds after injuries or operations; in which cases no restoring process can be established so long as this disturbed state of the nervous function continues.

When, in the course of the salutary fever induced by common inflammation, any circumstance occurs to create severe disordered action of the nervous system, the regular course of the fever is immediately arrested and completely changed, and a new train of symptoms, chiefly nervous, and of a more dangerous and destructive character, make their appearance. This circumstance has led some pathologists to consider constitutional nervous irritation as a morbid condition of the system, totally distinct from that which has received the name of fever. There appears, however, to be no good foundation for such a distinction, for the fever has merely assumed a new character, which corresponds exactly with that of the nervous, irritative, or typhoid fevers, that have been frequently described by nosological writers.

The description of fevers under consideration attend some of the worst forms of inflammation, such as confluent small-pox, the malignant varieties of scarlatina and rubeola, several species of gangrenous inflammation, and especially hospital gangrene: this combination of local inflammation with constitutional typhoid symptoms is often extremely perplexing, presenting to the practitioner at the same moment the most opposite and contradictory therapeutic indications.

We have already stated that the nervous and irritative class of fevers are to be attributed either to constitutional causes, or to the seat, extent, and nature of the local inflammation. The following are some of the principal constitutional causes, which are extremely numerous:—great mental depression, arising from anxiety, grief, or the apprehension of death; exhaustion from over-exertion of mind, and particularly from excessive study and loss of sleep; or that consequent upon large evacuations, either by spontaneous hemorrhage, or copious bleeding and purging: an impure atmosphere; certain natural states of the body, such as that of pregnancy and lactation; the long continuance of organic disease, especially in the uterus, testicle, stomach, urinary bladder, or any of the large joints. One of the most common and active causes, however, is the abuse of spirituous liquors; the constitution of those who indulge to excess in the use of malt liquors, (as, for instance, brewers' servants,) is distinguished by a state of extreme plethora, combined with nervous debility; and although apparently robust, they bear very ill the loss of blood, being soon affected with low delirium, partial convulsions, coma, and other symptoms of prostration. In habitual gin-drinkers the nervous system is so weakened by constant over-excitement, that they sink rapidly under a similar train of symptoms, from even slight inflammatory attacks. Over-activity and weakness of the nervous and vascular systems are predominant features of the constitution of infants and young children, and inflammatory symptoms rapidly attain in them a high degree of intensity which is soon followed by an opposite state of collapse and sinking.

Individuals endowed with great nervous irritability, and particularly puerperal women, are sometimes subject to sudden attacks of acute pain in the head, chest, or abdomen, accompanied with considerable constitutional disturbance, bearing so strong a resemblance in several of its symptoms to active inflammation, that the affection has often been mistaken for either arachnitis, pleurisy, or peritonitis; it is a form of disease depending, however, entirely on nervous irritation, combined at times with some degree of active congestion. The disease sets in with rigor, generally more severe and lasting than in cases of inflammation; the reaction is proportionally violent, and characterized by considerable nervous disorder and great irregularity in the course of the symptoms; there are frequent alternations from one extreme to another, differing in this respect from inflammatory reaction, which pursues its course more steadily. The general symptoms correspond with the description already given of the nervous and irritative forms of sympathetic fever, but it may be useful to offer a few observations on the local symptoms, for the purpose of defining more accurately the diagnosis of this affection from true inflammation, as it is sometimes rather obscure.

The affection of the head is characterized by acute general pain, great intolerance of light and sound, contraction of the pupils, vertigo, wakefulness, and delirium, sometimes even maniacal. This differs from arachnitis by the disease coming on more suddenly without any premonitory symptoms, and acquiring at once an extreme degree of violence; besides, in the latter the symptoms are less acute, and increase only gradually.

When the chest is affected, there is acute pain in some part, so severe as to check a deep inspiration; but the pain shifts its situation, shooting from one side to another, or towards the back; and if the patient be made to repeat the inspiration several times, the increase of pain becomes less and less; there is no cough or crepitus in making a deep inspiration, and the absence of all the signs of inflammation usually detected by the stethoscope will afford every information that can be desired for a correct diagnosis. There are, sometimes, severe attacks of palpitation and violent throbbing of the carotids, abdominal aorta, and all the large arteries.

The affection of the abdomen is denoted by acute pain and great tenderness on pressure, either confined to one part, or more or less diffused. There is as great an intolerance of pressure in some cases as exists in peritonitis, the more local pain resembling that of gall-stones. The distinction, however, from inflammation is established, by the suddenness of the attack, the violence and irregularity of the general symptoms, and the severe sympathetic affection of the head, which very seldom occurs in peritonitis or enteritis.

The effects of the treatment will afford additional sources of diagnosis. The loss of blood is not well tolerated in this form of disease, depletion to a few ounces causing syncope; whilst, in the inflammatory affections alluded to, the patient can bear the abstraction of forty or fifty ounces of blood before fainting is induced. Bleeding may sometimes appear to afford complete relief at the moment in cases of nervous irritation; but the paroxysm of pain soon recurs with equal if not greater violence; and it has persisted in some instances with unabated or increasing urgency, notwithstanding an enormous loss of blood. The symptoms on the other hand gradually yield to the use of purgatives and opiates, and of a light nutritive diet. In patients who have died of this affection no traces of inflammation have been discovered in any part of the body, and no other morbid appearance than at times a slight vascular injection of some of the organs.

This important form of disease had not been hitherto well understood; the profession is indebted for a good account of it to Dr. Gooch, and more especially to Dr. M. Hall.* It is attributed by the latter gentleman to intestinal irritation. This, no doubt, is very frequently the case, but we have traced it also to uterine irritation; and it may in some instances be referred to primary irritation of the brain, particularly in persons reduced to a state of great nervous exhaustion by any of the causes already mentioned. When excessive loss of blood by hemorrhage or bloodletting does not prove fatal through immediate sinking, it is sometimes followed by an excessive reaction resembling that we have just been considering, excepting only that the principal local affection is confined to the head, and there is a more marked tendency to subsequent exhaustion. We must refer for an excellent account of this latter affection to the article Bloodletting.

When inflammation occurs in constitutions in which an artificial plethora has been created by indulgence in the pleasures of the table, so that the functions of the different organs are oppressed by excessive repletion, the constitutional reaction is sometimes very feeble, the secretions are generally unhealthy, and the fever may assume a typhoid or adynamic character in consequence of this state of *indirect* debility. It is highly important to discriminate between a fever thus induced, and one of exactly the same character originating in *direct* weakness and nervous irritability. In the former case the debility being *indirect*, and the effect only of the oppression of the powers of life, the fever would be aggravated by the stimulating plan of treatment which in the latter case it may sometimes require; while, by disregarding the apparent debility, and having recourse to depletion and other active remedies, all the untoward symptoms are speedily removed, the character of the fever is transformed from typhoid to inflammatory, and both the local and constitutional affection pursues a more favourable course. It is in such cases that the pulse is found to acquire a greater degree of fulness, firmness, and regularity, under the repeated use of the lancet and the free exhibition of purgatives.

It was stated that the character of the constitutional symptoms was sometimes influenced by the *seat*, *extent*, and *form* of the local disease, independent of any predisposition of the constitution. Thus, with regard to *texture*, injuries of parts of little sensibility and low organization frequently induce a higher and more alarming degree of nervous irritation, than that of parts more largely endowed with nerves and blood-vessels; inflammation of the dense unyielding texture of tendons, ligaments, fasciæ, and fibrous membranes, especially of the periosteum, has already been mentioned as exciting an intense degree of local pain and tension. This generally gives rise to considerable disorder in the functions of the nervous system, while the constitutional excitement induced by the inflammation of mucous and serous membranes, or even of vital organs, more generally assumes the form of simple inflammatory fever.

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* Commentaries on the Diseases of Females, by Marshall Hall, M. D., &c.; and Morbid and Curative Effects of Bloodletting, by the same author.

The lesions of muscular and fibrous tissue, especially when the irritation is kept up by the presence of any extraneous body, are attended with a most severe degree of general irritation frequently ending in tetanus. Injuries or erysipelatous inflammation of the integuments of the head, chest, and abdomen, are followed by greater constitutional disturbance than those of other regions of the body, in consequence probably of contiguous sympathy. The inflammation of veins, which bear some analogy in their structure to fibrous membranes, is particularly characterized by symptoms of nervous and typhoid fever, and spreads rapidly along those vessels to a considerable distance. The injuries of nerves bring on most alarming symptoms of general irritation, being a frequent cause of convulsions and tetanus: this is chiefly owing to the propagation of morbid impressions along their branches, as they are rarely found inflamed. The ganglia of the great sympathetic form perhaps an exception, having been found by Mr. Swan intensely injected in cases in which the system had been strongly impregnated with mercury. (Travers, Inquiry concerning Constitutional Irritation.)

With regard to the *form* of the local injury, narrow and punctured are followed by more constitutional disorder than broad and open wounds; this frequently happens after the injury of some fibrous membrane or the puncture of a nervous filament, the complete division of which would have been of no importance. When the inflammation extends beneath a fibrous membrane, and suppuration takes place, the form of the wound not admitting of the discharge of the accumulated fluids, a considerable degree of tension and pain is the inevitable result. There may be for a time no local symptoms of the existence of the disease beyond a slight degree of tension and tenderness. When matter, however, is formed, an uniform diffused œdematous swelling, with erysipelatous inflammation of the skin, is observed round the margin of the wound, but without any distinct fluctuation; and this is accompanied with very violent constitutional disturbance, which can only be relieved by large and free incisions. The symptoms arising from the puncture of a nerve are more developed in the course of the nerve, and in the constitution generally, than in the wound itself.

Contused and lacerated wounds, especially when of considerable magnitude, and attended with great destruction of parts, are necessarily followed by most serious and alarming derangement of the constitution. This is the case with gun-shot wounds, especially when important organs are injured and foreign substances remain within the wound; from the exposure also of muscles by the tearing away large flaps of skin; the denuding of an extensive surface of the cutis by burns and scalds; the extensive laceration, exposure, and crushing or comminution of the larger joints; the displacement and protrusion of the ends of fractured bones, with partial or complete divisions of great muscles and blood-vessels. There is considerable danger in these cases of the powers of the constitution sinking rapidly under the shock they have received, as will be mentioned hereafter: but a fatal termination may likewise take place from the violence of the nervous irritation leading to convulsions and tetanus; or from the gradual exhaustion induced by the erysipelatous, gangrenous, and sloughing inflammation, which usually precede the reparatory process in all such extensive injuries.

The constitutional symptoms are also frequently characterized by great nervous irritability and depression, low delirium, and convulsions, after severe operations, either for recent injuries or the removal of chronic diseases. Hence the great importance, whenever practicable, of attending carefully to the state of the patient's constitution previous to the performance of any serious operation.

Besides the seat, extent, and form of the injury, the *nature* of the exciting cause has also a powerful influence over the character of the general symptoms. This is particularly evident in the case of poisoned wounds, whether received in dissection, or from the bites of venomous animals. We have, in this class of cases, very striking and instructive examples of the most dangerous forms of constitutional affection from local disease.

The constitutional symptoms correspond with the description already given of the irritative and typhoid forms of fever, varying only in different individuals as to the relative degrees of reaction and collapse, to the combinations of severe nervous symptoms, with weak or strong vascular action, and to the more or less vitiated state of the secretions. In a case described by Dr. Duncan, there was profuse dark-coloured clammy sweat of intolerable fetid and disagreeable smell, so abundant as to wet the bed-clothes and stain them of a dark colour. This diaphoresis was critical, and it scarcely ever occurs but in cases that recover.

There are considerable differences, however, with respect to the local affection. In some cases the poisoned wound is exempt from external inflammation, the patient sinking exclusively from the action of the morbid matter on the constitution; sometimes there is the formation of a vesicle or pustule on the wound, followed by pain and inflammation of the cellular membrane of the arm, axilla, and thorax of the same side; or without any reaction in the wound, there may be severe pain and diffused swelling in the axilla and breast on the wounded side, followed by patches of a red diffused swelling and excruciating pain in distant parts of the body. In other cases there is violent reaction in the wound, leading to suppuration and gangrene in the tendinous sheaths of the finger or hand, accompanied with painful diffused erysipelatous swelling of the arm, axilla, and integuments covering that side of the body. Sometimes numerous vesicles, some of a considerable size, have formed on the inflamed parts, containing either a transparent serum or a dark coloured fluid, the erysipelas round these vesicles assuming a dusky hue; and, lastly, the diffused inflammation of the cellular membrane on the arm or trunk has, in some instances, terminated in extensive suppuration and sloughing. The remarkable disposition shown by the inflammation in all these cases to rapid extension, arises, no doubt, from its affecting tissues in which inflammation generally spreads by continuity, such as the absorbents, veins, subcutaneous cellular membranes of tendons, and fasciæ of muscles. (See Travers, Inquiry concerning Constitutional Irritation.) This is also owing in some measure to the erysipelatous character of the inflammation, which induced Dr. Good to give it in his nosology the name of *erythema anatomicum*.

The constitutional symptoms are chiefly to be ascribed to the introduction of the poison into the mass of the blood, whose qualities it vitiates and renders deleterious, and to the morbid action of this deteriorated blood on every part of the animal economy, and more especially on the vital organs; poisons have also been conceived to affect the nervous system in a more direct manner by the transmission of morbid impressions along the nerves. We have already stated that there are strong arguments and facts in support of each of these opinions, and that it is probable that the influence of both causes must to a certain extent be admitted.

It has been remarked that the constitutional affection is often as severe, and proves as rapidly fatal, in cases attended with scarcely any local affection, as in those in which whole regions of the body are engaged in inflammation. Extensive local disease is not therefore always so serious an aggravation as might at first be supposed; the danger is in proportion to the degree in which the poison has been mixed with the blood and has deteriorated its qualities, and to its paralysing influence on the nervous power. It is generally considered that whenever the action of the poison can be confined either to the wounded or to any of the other inflamed parts of the body, by exciting in them inflammation of a healthy character, its pernicious influence on the constitution is considerably lessened, if not altogether prevented. Mr. Travers very justly observes, "Inflammation is not necessary to the most virulent and fatal action of the poison, and in general I should be disposed to say of these cases, that the symptoms of local inflammation and constitutional irritation exist in an inverse ratio of severity."

A great many interesting cases illustrating the different forms of local and constitutional affection produced by poisoned wounds, are to be found in Mr. Travers' Inquiry concerning Constitutional Irritation—a work the most complete and valuable without exception yet published on the highly important subject of which it treats, and reflecting the greatest credit on the author's talent and observation.

The form of the disease most analogous to the preceding, is that arising from the bite of the more venomous serpents, and especially of the rattlesnake (*crotalus horridus*, Lin.), and of the cobra di capello (*coluber naja*, Lin.); it only destroys life in a shorter time. The local and constitutional symptoms take place nearly simultaneously; the bitten limb swells instantaneously, and the inflammation shoots with great speed up its entire length to the axilla and shoulder; and if life continue long enough, it darts down the side over the pectoral muscle, and produces there the same kind of erythema as in the cases already described. The vital principle, however, is from the first suddenly exhausted, as if by a stroke of lightning; the blood ceases to flow in the smaller vessels of the swollen part, which feels deadly cold; the action of the heart is so weak that the pulse is scarcely perceptible; the stomach so irritable that nothing can be retained in it; dejection and horror overpower the mind, and the patient sinks with a low muttering delirium. Very powerful stimulants applied instantly may check the deadly influence of the poison, and sometimes produce a cure; but if life be sustained until the venom has exhausted its malignity, the debility is so extreme, and the sphacelus so extensive, that the unhappy sufferer often falls a victim to the local mischief. Dr. Mason Good, from whose Nosology the foregoing description is taken, gives an interesting account of the case of a man who died in St. George's Hospital, from the bite of a rattle-snake exhibited in London; he remarks that all other serpents have an immunity against each other's bite; but the rattle-snake not only kills every other, and even its own kind, but being so far irritated as to inflict a personal wound, has been found to kill itself.

The frightful assemblage of symptoms that characterize hydrophobia afford an example of the highest conceivable degree of over-excitement, and fatal disorder of the whole animal economy. One very remarkable circumstance connected with the action of the rabid virus, is the great length of time during which it has in some cases remained dormant in the constitution before taking effect; it is difficult to account for this long period of incubation of a virus that proves so rapidly destructive after it begins to operate. The invasion of the constitutional symptoms is sometimes accompanied with slight pain and inflammation of the wounded part; but the local affection is never severe, and in some cases completely wanting.

In all the preceding cases there have been very few traces of disease found after death, beyond those resulting from the local inflammation; the only morbid appearances ever observed have been partial vascular injections in some of the internal organs, and this only in a small proportion of cases. A high degree of injection of the medulla oblongata and pharynx is stated to have been found in some cases of hydrophobia.

3. The third modification of the constitutional derangement induced by local irritation or inflammation in the irritable temperament, is that of sinking without reaction. The symptoms of this state of sinking are not unlike those of a prolonged fit of syncope, only more severe. The patient first experiences a degree of vertigo followed more or less quickly by gradual loss of consciousness. This, however, is sometimes only partial, there being rather a tendency to drowsiness, from which the patient can be momentarily roused by any strong and sudden impression; he is also affected with a sensation of shuddering, considerable degree of universal pallor, contraction and coldness of the surface, and particularly of the countenance; the pupils are dilated; the breathing is short, at one time almost imperceptible and only carried on by the diaphragm, or at another interrupted by short irregular sighing; the pulse is slow, feeble, or indistinct; the tongue and fauces are dry, the stomach is irritable, and vomiting sometimes procures relief by creating a general reaction. When, however, this is not the case,

other more formidable symptoms make their appearance; the pallidness, collapse of the countenance, and coldness of the surface, increase; the breathing becomes more oppressed, and is attended with a peculiar crepitating noise; there is restlessness, jacitation, and delirium, followed by coma, convulsions, relaxation of the sphincters, and stertorous breathing, ending soon in death.

The symptoms offer, however, many variations; in some cases the patient falls so gradually into a state of apparently quiet sleep, as not to excite any suspicion of danger; but this is succeeded by stupor, and he dies without any struggle. In other cases, he is affected with delirium, restlessness, and frightful convulsions. Convulsions, however, may appear without delirium or coma, the latter being of most frequent occurrence in infants. When sinking does not terminate in death, it is followed by either partial, excessive, or healthy reaction. In slight and temporary syncope, returning animation is indicated by the gradual restoration of warmth on the surface, with occasionally a gentle moisture of the skin; the breathing becomes more full and free; there is deep sighing and sometimes hysterical sobbing; the pulse recovers its fulness and strength; and consciousness gradually returns as if the patient were awaking from sleep.

In the state of more severe sinking, reaction is generally ushered in by rigor: a state of great depression of the nervous energy has the effect of lowering the action of the heart, and causing a gradual accumulation of blood in the central parts of the body, while the circulation is diminished in the capillaries of the surface and extremities. This uneqnal distribution of the circulating fluid impedes the action of the two most important vital organs, until the constitution, unable to bear any longer the irksome oppression, is roused to a convulsive effort, in order to remove the obstacles opposed to the circulation and respiration. The commencement of this effort at reaction is indicated by rigor, and sometimes also by vomiting and hiccup; the action of the heart is immediately increased, and the reaction becoming general, leads to a restoration of the circulation and heat of the surface, to a relief of the embarrassed breathing, and to a revival of the depressed energies of the brain and nervous system. If these changes take place without violence and are sustained for some time, a permanent healthy reaction is established; they may, however, be only momentary, in consequence of the insufficiency of the nervous power to keep up reaction, and the patient sinks again into collapse. Rigor of long continuance without any return of heat, or frequently recurring, indicates likewise a want of power in the system. At other times the reaction may be too strong, and lead to a condition of the system opposite to sinking,—that of over-excitement. The shudder which accompanies the shock differs from rigor: it is a cerebral affection of short duration, produced by a painful impression of the mind, and it is not necessarily connected with any change in the temperature of the body. (Inquiry concerning Constitutional Irritation, by B. Travers, Esq. p. 138.)

It is of great practical importance that the distinction between these opposite morbid conditions of the system should be well understood, and the changes from the one state to the other require to be watched with the utmost vigilance; for the treatment which may be the means of restoring life during the period of sinking, might prove destructive during that of reaction. The rule laid down by Mr. Travers, of maintaining action without forcing action, should be constantly borne in mind; the effect produced by stimulants must also be carefully observed, in order that they may be laid aside as soon as reaction has taken place, and opposite measures should then be adopted if required.

The state of sinking is brought on by all causes tending to depress considerably the nervous power. Nervous weakness being the chief characteristic of an irritable constitution, it is strongly predisposed to this form of disease. The effect of sudden and painful emotions on weak and irritable persons in causing syncope and convulsions is well known, and has even proved fatal in individuals much exhausted by disease. The breathing of putrid and pestilential effluvia has sometimes caused such a degree of faintness and sinking that life has been extinguished before reaction could take place. Individuals have died in the cold stage of the algide fever from a similar cause. Several powerful narcotics, by completely paralyzing the action of the brain and nerves, and probably also that of the heart, prevent all reaction, and destroy life with amazing rapidity. Patients who have been much exhausted by long and painful inflammatory affections, sometimes sink unexpectedly at the moment they were considered convalescent. Some of the cases of sudden and unexpected death that take place without any known cause during attacks of severe illness, may reasonably be accounted for in this manner. Profuse hemorrhage is a frequent cause of sinking, especially in puerperal women, whose vital powers have been much lowered by the sufferings of tedious and painful labour: the sinking in these cases is often attended with frightful convulsions. Among the frequent causes of sinking is to be reckoned the sudden shock the constitution receives from severe injuries, which operate in this way either in consequence of their extent or of the tissues that are affected; as, for instance, when many textures are implicated in a wound, and extensive portions of skin detached, or when joints and tendinous structures are lacerated, and large bones comminuted.

The effect of extensive burns in causing direct prostration is very remarkable; the great sensibility of the skin as the organ of tangible impressions, the importance of its functions as a secreting surface, and its numerous sympathies with all the vital organs, will sufficiently account for the system receiving a severe shock when it is extensively injured. The danger is greater when the burn is seated on the integuments of the trunk than on those of other parts, in consequence, probably, of contiguous sympathy. The tendency to sinking may continue for the first three days after the accident; but at the end of this period, reaction is generally established. The situation of the patient is very analogous to that of a person stunned by a fall; he is in a state of apathy bordering on stupor, without actual loss of consciousness; there is an absence of all pain, as if the sensibility had shrunk below the point of pain. The complaint of pain is, therefore, rather a favourable sign: continued shivering is completely the reverse.

The shock which the brain receives in concussion brings on symptoms of sinking; the stupor resulting from other casualties is the effect only of functional disorder, while that arising from injuries of the head is generally connected with physical derangement of the organ: in the latter case, when reaction takes place, there is much greater reason to apprehend and guard against cerebral inflammation than in the former.* Children are sometimes affected with sinking after excessive evacuations; this is chiefly indicated by a tendency to stupor and coma, which has often been mistaken for hydrocephalus. Full details respecting the diagnosis and treatment of this important affection will be found in the article HYDROCEPHALUS. The shock inflicted by the pain of a severe operation often brings on sinking, especially if the vital powers have been previously depressed by recent injury or painful chronic disease, or else if the patient has been under great dread of the operation, or much alarmed at the prospect of death.

Severe and intense pain is of itself destructive. Puerperal women have sunk after difficult and protracted labour, from the mere paralysing effect of intense and long-continued pain; ruptures of the stomach, gall, and urinary bladders are sometimes productive of such sudden and excruciating pain as to bring on rapid and fatal syncope. The effects of severe pain are variable: the sudden infliction of intense pain may be instantly followed by such a degree of direct general torpor that the individual appears as if completely stunned, and little or no pain is afterwards experienced. When intense pain is long endured, it absorbs every other feeling, and induces a remarkable degree of insensibility to all surrounding impressions. Severe pain at other times brings on delirium, convulsions, vomiting, suspension of the secretion of urine, and other symptoms of over-excitement; but this is of short duration, and is soon succeeded by a state of exhaustion and torpor. Long-continued pain impairs all the operations of life, and gradually exhausts the vital principle itself; so that pain has been justly called the greatest sedative in nature. The sudden remission of intense pain has sometimes been followed by syncope and death.

Very intense pain of an unimportant part is sometimes well tolerated; while slight pain of a vital organ or highly sensitive part, such, for instance, as the urethra, may be sufficient to cause syncope. The constitution in some cases becomes accustomed to the impression of moderate pain, when frequently repeated or long-continued; the susceptibility to all impressions, whether pleasurable or painful, being lessened by habit. When the pain of inflammation is so intense as to constitute its most prominent symptom, and has not yielded to full depletion, the inflammation is sometimes kept up by the continuance solely of the pain. It is of great importance in such cases to subdue the pain at once by means of large opiates; we have seen attacks of peritonitis attended with violent pain yield immediately to this plan of treatment.

We shall conclude this short account of the various acute forms of constitutional derangement that are induced by inflammation, with the following concise and at the same time comprehensive remarks of the great Hunter:—"Nature requires to feel the injury; for where, after a considerable operation, there is rather a weak, quiet pulse, often with a nervous oppression, with a seeming difficulty of breathing, and loathing of food, the patient is in a dangerous way. Fever shows power of resistance; the other symptoms show weakness sinking under injury." (Treatise on the Blood and Inflammation, ch. iv. s. 6.)

Local inflammation may go through its different stages without any interruption, except a certain degree of exacerbation and remission in its symptoms at different periods of the twenty-four hours. But inflammation is also sometimes intermittent, and even periodical, and the constitutional symptoms in these cases follow the order of the local symptoms. There is a greater tendency to periodicity and intermission whenever the nervous system is much affected.

The order in which the constitutional symptoms occur with respect to the local symptoms is variable. In some instances they precede the local, as in the whole class of exanthematous diseases, and often also in erysipelas. In most inflammatory affections arising from external injury, the febrile symptoms succeed to the local at a longer or shorter interval of time, according to the seat and severity of the injury, and the susceptibility of the constitution. In some very severe injuries, as for instance in extensive burns, the local and constitutional symptoms appear almost simultaneously; the same is often observed in severe inflammation of the pleura and peritoneum.

There are also differences between the local and constitutional symptoms with respect to their relative degree of violence. The febrile symptoms, as before observed, run sometimes so high that they completely conceal the local affection; and they may assume so formidable an appearance, either from their violence or malignity, as to constitute the chief source of danger. Inflammation is sometimes excited in distant organs by sympathy with the organ first affected, and the secondary inflammation becomes stronger than the primary, so as to completely supersede it; in which case a new disease is established. If, however, inflammation proceeds in two organs at the same time, the additional disease, although even slight, increases considerably the danger, particularly if the constitution has been much impaired by the first inflammation.

The organs the most subject to be affected with sympathetic inflammation are the brain, the lungs, the alimentary canal, and sometimes the skin. There are often more severe sympathetic pains in other organs than in the inflamed one, these pains being chiefly of a nervous character: this is particularly the case in inflammations of the mucous membrane of the alimentary canal and urinary bladder, and also in nephritis. Gastro-enteritis is frequently attended with severe pain in the head and loins, or violent cramps and pains in the lower extremities, while very little pain is felt in the stomach and bowels: this accounts for the original disease in these cases being so frequently overlooked. Severe pain in the stomach is one of the common symptoms of nephritis. There is a markable tendency in some varieties of inflammation to change frequently their position through the influence of sympathies; this peculiarity is frequently observed in erysipelas and rheumatism, and in the inflammation of the parotids called *mumps*, which is often superseded by inflammation of another organ, as the brain, the testis, or mamma. This erratic tendency of inflammation will be more fully considered when treating of metastasis.

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* For a full account of the phenomena of shock, &c., see Travers, Op. cit.

Idiopathic, or essential, and symptomatic fever have been considered by some pathologists as differing materially in their nature. There does not, however, appear to be any reasonable ground for this distinction. Inflammation is frequently the exciting cause of fever; but on the other hand, inflammation often occurs in the course or towards the decline of fever, as one of its consequences. The primary morbid phenomena essential to the existence of fever—a disturbance in the functions of the heart, the brain, and the stomach—are always the same, whether arising from a deteriorated state of the blood, from external morbid impressions acting on the brain and nervous system, or from sympathy with a diseased organ. These exciting causes may possess different degrees of activity, create a greater disturbance in one order of functions than in the others, and be single or combined in the same case; and hence the variations observed in the character, severity, and course of the symptoms by which the different types of fever are distinguished. When an inflamed organ is the exciting cause, the fever subsides as soon as the inflammation is subdued. When a vitiated state of the blood is the cause, the fever likewise subsides as soon as the blood has recovered its healthy qualities. When both these causes are combined in the same case, although the local inflammation may be quickly removed, the fever pursues its course until the blood also is restored to its healthy condition. We have in each of these cases the same primary morbid phenomena, differing only in degree, and in being variously combined according to the nature, activity, and combinations of the exciting causes.

Before concluding our remarks on the different forms of symptomatic fever, we have to notice some peculiarities in the state of the pulse and in several of the other symptoms, deserving of attention. The character of the pulse varies not only with the intensity of the inflammation and type of the fever, but also according to the particular organ or structure affected. The pulse of common acute inflammation is generally characterized by fulness, hardness, and moderately increased frequency. In the inflammation, however, of some of the abdominal viscera, such as the stomach and intestines, the pulse is small, contracted, wiry, and rapid; there is also a remarkable degree of sinking and general prostration of strength, the consequence probably, of the extensive sympathies of these organs with the brain and spinal marrow, through the medium of the ganglionic nerves. These two peculiarities in the symptoms might possibly mislead, if not well understood, with respect to the true nature of the complaint, and prevent the adoption of those active measures by which alone the patient can be saved; the usual effect of free depletion in these cases is to increase the fulness and strength of the pulse; this variety of the pulse has been called *abdominal*, as it is seldom observed in inflammation of the organs of other cavities; it does not either attend the inflammatory affections of all the abdominal viscera, but more particularly the inflammations of the digestive tube, especially when seated in the peritoneal coat and various prolongations of that membrane.

The character of the pulse is likewise influenced by the particular structure affected. In the inflammation of serous and fibrous membranes, and in most cases of inflammation attended with intense pain, the pulse is in general contracted, hard, wiry, and very frequent; whilst in inflammations of the cellular tissue, of mucous membranes, and of parenchymatous and glandular organs, the pulse is usually fuller, softer, and less rapid; in diarrhœa the pulse, as is well known, is sometimes intermittent. The frequency of the pulse, instead of being increased, may be reduced below the standard of health, notwithstanding the existence of severe and dangerous inflammation; this arises generally from some affection of the brain, lessening the general susceptibility of the system, and preventing the free development of the constitutional symptoms. In the inflammation of muscular and fibrous tissues, there is a very high degree of heat, and great frequency of pulse, followed by profuse and long-continued perspirations; the degree of danger, therefore, as before stated, is not always in proportion to the severity of the general symptoms.

We have hitherto been considering the various forms of constitutional affection arising from *acute* inflammation. We have next to describe the constitutional derangement that attends *chronic* inflammatory diseases, and which differ from the preceding in several points of considerable importance.

Constitutional Symptoms of Chronic Inflammation.—The term chronic inflammation implies the absence of acuteness and activity, and a tendency to long continuance. Inflammation may be of a mild and obscure character from the beginning, or else it may have been acute at first, and have subsequently assumed a mild and *chronic* form. If after acute inflammation has reached its height, it is not brought to a speedy termination, or is only partially removed, it has a great tendency to become chronic. Both the local and general symptoms of chronic inflammation differ in several respects from those of acute, and require also some important modifications in the mode of treatment. We shall first briefly consider the principal differences observed in the local symptoms, as they will assist in explaining the modifications of the constitutional symptoms.

The local symptoms are never so strongly marked, and are sometimes, indeed, so obscure as to be perceptible only to the scrutinizing eye of an experienced observer; there is but a very slight degree of pain, seldom much heat or redness, and sometimes but little swelling. The functions of the inflamed organ are more or less disturbed; in some cases the functional derangement is remarkably slight, notwithstanding the existence of extensive organic disease: the secretion of bile has often continued healthy in livers considerably enlarged and thickly studded with tubercles; the respiratory function has not been very sensibly affected, although a vast abscess has been found in one of the lungs. When the progress of the inflammation has been very slow and circumscribed, so that the remaining portions of the organ have preserved their healthy condition, and the constitution has been able to adapt itself gradually to its diminished activity, the local affection is not aggravated by any strong general reaction.

Mild cases of chronic inflammation excite very little general disturbance; this is sometimes limited to a slight loss of flesh and decrease of the general strength, and is also characterized in some cases by a change in the colour of the skin, which becomes either pale or sallow. The severer cases are attended with various degrees of febrile excitement, never amounting to the regular continued fever of acute inflammation, but occurring in paroxysms with variable intervals of more or less complete remission. During the latter part of the day, or first hour of the night, the patient experiences a sensation of general uneasiness, languor, and sometimes chilliness, followed by headach, frequency of pulse, heat of skin, dryness of the mouth, and thirst; these symptoms continue until morning, when they subside either with or without perspiration. There are frequently conjoined with the preceding, a variety of nervous symptoms, especially in chronic inflammation of the liver and uterus; and the local affection not being detected, the disease has been often treated as purely nervous. When the disease lasts for any considerable time, the general health becomes materially impaired; the patient is affected with progressive emaciation, or sometimes partial dropsy, and dies in a state of marasmus. If the inflammation leads to suppuration, symptoms of regular hectic fever make their appearance.

The progress of chronic inflammation is generally marked by many variations, the symptoms being at one time slow and obscure, or to all appearance so completely removed as to excite hopes of recovery, and increasing suddenly at another time without apparent cause. Chronic inflammation is prolonged in some cases by a frequent repetition of the exciting causes, such as irregularities of diet, exposure to cold, &c., or its continuance may depend on the weak and irritable state of the constitution. One circumstance important to be remembered is the strong tendency of chronic inflammation to assume an acute form, from the influence of even very slight causes. This passage of chronic into acute inflammation is generally attended with considerable danger; for an organ of which the structure has been previously weakened or perhaps materially altered, is little able to resist the effects of acute disease. Sometimes, however, the supervention of acute inflammation has been the means of removing chronic disease of long standing, as is often the case with chronic sores and swellings.

Chronic inflammation has, in some cases, been quickly removed on the sudden appearance of some other more general affection, such as a cutaneous eruption, rheumatism, gout, &c.; it seldom terminates in gangrene, but most frequently in the thickening and induration of textures, the formation of false membranes; or in adhesions, ulceration, sero-purulent effusions, ossification, or the formation of new tissues. When acute inflammation is on the decline, the danger of rousing anew excessive action by the premature exhibition of stimulating diet or medicines is generally understood; there is, however, another risk at this period, which is not unfrequently overlooked. When the strength of the patient has been reduced beyond a certain point, by too long a perseverance in the use of active remedies and of low diet, there may not be sufficient power for the establishment of the restorative process, and the inflammation may assume from this cause a chronic and unhealthy character; this is particularly liable to occur in old or weakened subjects. The study of this class of inflammations is of considerable importance, and a great deal of valuable information on the subject will be found in the works of Pugol and Broussais. (Histoire des Phlegmasies Chroniques.)

Progress and Duration of Inflammation.—The progress of inflammation, with respect to its more or less favourable course, is influenced by the structure, situation, and state of the part affected, by temperament, hereditary disposition, diathesis, age, sex, habits of life, quality of the air, climate, &c. We shall offer a few remarks on the influence of each of these circumstances.

It is observed, with respect to *structure*, that in highly organized and vascular parts, in those in which the circulation is vigorous from their vicinity to the heart, and endowed with a strong nervous energy, inflammation is generally more disposed to run a speedy and favourable course, than in parts of an opposite structure, or more remote from the centre of the circulation. Hence inflammation of the skin, cellular tissue, and muscles goes more rapidly through its different stages, whatever be its termination, than the same affection in bones, tendons, fasciæ, and ligaments; when parts possessing a low vitality are preternaturally excited, they frequently mortify, not having sufficient power to resist the disturbance of the inflammatory action. The lower parts of the body are, for the above reasons, more prone to inflammation, and when inflamed recover more slowly than the superior parts; a depending position retards also the curative process by impeding the return of the blood through the veins. The inflammation of vital organs, although they are very vascular, often takes an unfavourable course, on account of their extensive sympathies giving rise to severe constitutional reaction.

One of the remarkable and important laws of healthy inflammation is that of its being always most actively developed on the side of the part affected which is nearest to the external surface, or to some outlet; this is beautifully exemplified in the pointing of abscesses; if seated under the skin, or in the muscles, the walls of the abscess become thinned by absorption on the side nearest the skin, and the pus tends to make its way to the surface; or if seated near the intestines, the pointing takes place towards the cavity of the bowel. It is thus that foreign substances are sometimes cast off, after remaining even for years lodged in some parts of the body,—a passage being gradually made by the spontaneous development of inflammation on that side of the substance only which is nearest the surface.

With regard to the *state* of the part, whenever it has been previously weakened by inflammation, it is more predisposed to a return of disease, and each attack lessens the chance of a complete and permanent recovery; thus persons who have suffered from severe injuries of the head are sometimes rendered delirious by stimulating food, or taking the smallest quantity of any spirituous liquor. When the circulation of a part has become languid, in consequence of the ossification of its vessels or of paralysis, there is not sufficient power for the perfect development of the inflammatory process, and it often terminates in mortification. All new-formed parts, such as encysted or sarcomatous tumours, excrescences, granulations, cicatrices, false membranes, callus, &c. having only a low degree of vitality, cannot long resist inflammatory action, and are soon destroyed either by ulceration or sloughing.

We have already adverted to the influence of *temperament* over the constitutional symptoms; the local character of inflammation is also considerably modified by diversities of temperament: thus the sanguine temperament is predisposed to acute inflammation of highly vascular organs; the bilious temperament to erysipelas, &c.

Inflammation is greatly modified also by the *diatheses*, or morbid predispositions, and in many cases these morbid states of the constitution give the inflammation a specific character: thus the scrofulous, rheumatic and gouty diatheses, whether natural or acquired, give origin to as many corresponding varieties of inflammation, as will be more particularly specified hereafter. Many peculiarities of constitution are transmitted from parents to their progeny; these hereditary morbid tendencies are likely to be brought into action, if the individuals be placed in circumstances favourable to the development of the diseases which they induce; otherwise they may long remain dormant in the constitution, and sometimes even, after passing over one or two generations without manifesting themselves, may break out in the third.

The progress of inflammation is materially affected by *age*, in consequence of the changes in the activity of the circulation and distribution of blood, and in the energy of the nervous system observed at the different periods of life. In *childhood*, the circulation being very active, the inflammatory process is always rapid and mostly healthful; but the great determination of blood to the head, peculiar to that age, occasions a more than ordinary tendency to inflammatory affections of the brain and other parts about the head, such as hydrocephalus, ophthalmia, otitis; to mumps, and other glandular swellings of the neck; to cynanche, cutaneous eruptions of the scalp, &c. The inflammatory affections of children are frequently attended with convulsions, owing to the great susceptibility of their nervous system. Another peculiarity by which these affections are distinguished is their remarkable disposition to assume either a remittent or intermittent form; this may perhaps be also attributed to the irritability and weakness of the nervous system in childhood. In *youth*, the progress of inflammation is still more vigorous and healthful, but the tendency to affections of the head diminishes, and the thoracic viscera become more prone to inflammation; accordingly pneumonia, pleurisy, and phlegmonous inflammation, are observed to prevail at that age. In the *adult* period of life, inflammatory action appears more particularly directed towards the abdominal viscera, giving rise to attacks of gastritis, enteritis, hepatitis, nephritis, cystitis, &c. In *old age*, as the powers of life decline, the energy of the vascular system becomes weakened, and its organization is frequently impaired; the inflammatory action is therefore much more languid, and less disposed to terminate favourably; this unpropitious tendency is often increased by the pre-existence of visceral disease. This period of life is also characterized by weakness and irritability of the nervous system. The most common inflammatory affections of old people are chronic catarrh, peripneumonia-notha, chronic cutaneous eruptions, gangrenous erysipelas, &c.

The influence of *sex* is to be considered. The greater delicacy of fibre and higher degree of nervous susceptibility of females, predisposes them more to inflammation than men; although this is in some measure counterbalanced by males being more exposed to the influence of the exciting causes from the nature of their pursuits and their irregular habits of life. The course of inflammation in women is more rapid and less steady than in men, being complicated with many nervous symptoms: their inflammatory affections are also greatly modified by the influence of the uterine functions.

The *habits* and *condition of life* are likewise deserving of some consideration. In persons of sedentary habits, or who indulge in food and liquor to excess, inflammation is generally severe, and often assumes an unhealthy character, in consequence of the repletion of the system and vitiated condition of the fluids. When the body has been much debilitated by a deficiency or the bad quality of the food, previous disease, or any other cause of weakness, the inflammation is languid, and there is not sufficient power to establish any reparatory process; hence the great difficulty often experienced in such cases in obtaining the reunion of fractured bones, the healing of ulcers, or resolution of tumours, &c. There are also peculiar forms of inflammation induced by particular employments; as, for instance, the chimney-sweepers' cancer, the bakers' and grocers' itch, the barrel-grinders' cough &c., an excellent account of which will be found in the article ARTISANS, DISEASES OF.

The effects of *air* on the progress of inflammation are very remarkable, and entitled to particular attention. They are to be attributed chiefly to the important influence of the air over the qualities of the blood and vigour of the circulation. A pure air imparts to the blood rich and nutritive properties, and acts as a stimulus to the circulation, so that wholesome materials are supplied, by which the inflammatory processes are carried on with activity to a favourable termination; in an impure and foul air, the blood is impoverished or vitiated, the circulation feeble or irregular, and all the morbid actions necessarily partake of this deficiency of power. The air exerts moreover a powerful and direct influence over the nervous system, and through it on all the functions of life, especially those of the digestive organs, and of the skin. These reasons sufficiently account for the slow progress of inflammation, and the unhealthy character it so frequently assumes in close ill-ventilated apartments, low situations, cold and damp seasons, or during the prevalence of certain winds; and likewise for the remarkable improvement observed after the removal of patients to a more airy situation, by transferring them even from a lower to an upper floor in the same building, and after favourable changes of weather. It has been justly remarked by Mr. James, (James on Inflammation, p. 80) that there is no poison more injurious than foul air, and no restorative more effectual than pure air; indeed it exercises in this respect a greater influence than even food. The effects of the damp and foul air of ill-ventilated wards in causing the diseases called hospital gangrene, have been frequently noticed by practical writers.

Besides these general effects of air, there are certain regular and periodical changes produced in the human constitution by the different seasons, which considerably modify the character and course of inflammation; these changes seem to depend partly on the circumstance of each season causing a greater determination of blood towards certain organs than others. We thus see inflammatory diseases most prevalent during winter and spring: pneumonia, inflammatory catarrh, and acute rheumatism are principally diseases of winter: pleurisies, cerebral inflammation, the febrile exanthemata, and other acute diseases of the skin, are the general concomitant affections of spring. In summer and autumn there appears to be less predisposition to very acute inflammation, and the predominant diseases of these seasons are congestions and subacute inflammations of the liver and mucous membranes of the alimentary canal, such as bilious fever, gastro-enteritis, dysentery, diarrhœa, and cholera morbus. During the prevalence also of epidemic diseases, all local inflammations are observed to partake more or less of the type of these diseases. If it be inflammatory, the local diseases are very acute; if typhoid, the local inflammation is of a low type. Some epidemics create a remarkable tendency to erysipelatous inflammation, and when the epidemic has either a remittent or intermittent type, the most common inflammations show a remarkable tendency to assume the same character. This influence of epidemic constitutions over local diseases has been well described by some of the ancients, and especially by Sydenham and Stoll.

The *duration* of inflammation varies according to its intensity, the texture of the part affected, nature of the exciting cause, and state of the constitution. Violent inflammation is seldom of long duration; it may exist for only a few hours, and has sometimes proved fatal in the course of a day; it passes through its different stages with great rapidity in infants, who require on that account to be visited frequently when labouring under inflammatory affections, as considerable changes may take place in the course of even a few hours; it may also prove rapidly fatal when affecting vital organs, such as the heart and brain, particularly if attended with excruciating pain. When inflammation is not violent, it may last for months, and even years: this difference in duration forms the ground of one of the divisions of inflammation that will be presently examined. Inflammation, when of long continuance, frequently induces changes of structure. One of the effects of long-continued inflammation is to leave the vessels so much weakened that they remain preternaturally dilated, and the part preserves a certain degree of redness and thickening which may not disappear for years; this happens particularly in the cicatrices and scars consequent upon burns and old ulcers.

Varieties and Divisions of Inflammation.—The variety of forms assumed by inflammation are extremely numerous, and have been arranged under some classification or other by most practical writers. But in the present state of pathological knowledge we are too imperfectly acquainted with the exact nature of proximate causes, and with many other important circumstances relating to the history and theory of diseases, to be able to frame any truly scientific nosological arrangement, and all the classifications of inflammation are on that account more or less defective. They are deserving, however, of some notice, as tending to give a systematic view of the most important peculiarities of inflammation, and as affording some assistance in the study of this multifarious class of diseases, and in laying down general rules of practice.

Inflammation has been divided into *acute* and *chronic*: it is important that these terms should be understood as expressing only different *degrees* and not different *kinds* of inflammation. The term *acute* is generally used to denote that the inflammatory process is both active and of short duration: it may be considered sufficiently accurate in the former sense, but will often prove incorrect in the latter; for inflammation is susceptible of being maintained in a state of great activity for a considerable length of time, especially if the exciting cause continues in operation, or its application be frequently renewed. *Chronic* inflammation implies the absence of acuteness or activity, and a tendency to long duration. When acute inflammation is only imperfectly relieved, it often continues for a considerable time in a state of lessened activity, and is then chronic in every acceptation of the term; but inflammation may be of an obscure and mild character from the very beginning, and it cannot therefore be correctly called chronic from the mere absence of acuteness. An intermediate degree of inflammation between the acute and chronic has been termed *subacute*; this frequently consists of the state we have described by the name of congestive irritation.

Inflammation has also been divided into *active* and *passive*: these terms designate merely the degree of intensity of the inflammatory action, and are not exactly synonymous with acute and chronic; for passive inflammation may be of short duration, whilst active inflammation may, as already stated, be more prolonged. When the pain, redness, and heat are only slight, while the swelling is considerable and attended with an abundant secretion, the inflammation is said to be passive: this form of affection ought rather to be considered as a species of congestion; and the term passive can scarcely be applied with strict propriety to any species of true inflammation. Inflammation is sometimes distinguished into *tonic* and *atonic*; these terms refer more to the powers of the constitution than to the intensity of the local disease. When the constitution is strong, the inflammation is called tonic. If the constitution be in a state of debility, there may be very violent inflammation in a part; but in consequence of the want of sufficient power in the system to maintain this local action, it soon subsides; and the inflammation either disappears, as is seen in atonic gout, or perhaps mortification takes place. This is called atonic inflammation. The terms *sthenic* and *asthenic* have also been applied to inflammation; they are derived from Dr. Brown's well-known division of diseases into two great classes, and refer, like the terms tonic and atonic, to the powers of the constitution; sthenic being used to express a high degree of power, and asthenic a deficiency of power.

In order to avoid the ambiguous and ill-defined notions generally conveyed by the terms active and passive, acute and chronic, &c., as applied to inflammation, Andral has adopted a new and very simple division. He classes all inflammations and congestions under one head, termed *hyperæmia*, or excessive presence of blood in the part. When the accumulation of blood is due to increased action, this constitutes *active hyperæmia*, including all forms of active congestion and inflammation. When, on the contrary, the accumulation of blood arises from debility or obstruction, &c., it is called *passive hyperæmia*, which comprehends passive congestions. Andral's division has still, however, the disadvantage of applying the same name to diseases very dissimilar in their characters, such as, for instance, every variety of active congestion and inflammation; besides, moreover, the great inconvenience always attached to the introduction of any new nomenclature in science. It appears, therefore, more desirable to adhere to the old terms, endeavouring only to give them a more precise meaning.

Inflammation may be *continued*, *remittent*, or *intermittent*. Acute inflammation in healthy constitutions endowed with sufficient power to maintain vigorous action, assumes most generally the continued form. We have already stated, in speaking of the influence of age, that the inflammatory affections of children exhibit a great tendency to remittence or intermittence; and that the same peculiarity is sometimes observed in persons of an irritable temperament or advanced in life. We have instances of intermittent inflammation in ophthalmia, which sometimes returns very violently every evening, or every other evening, at a certain hour. Otitis is frequently intermittent; and catarrh has also occasionally assumed a periodical character. (Elliotson's Lectures on Inflammation, Med. Gaz. Dec. 1831.)

Next to the duration and different degrees of intensity of inflammation, its causes have also been adopted as the basis of several divisions. Inflammation, considered in this point of view, has been distinguished into *accidental*, *spontaneous*, and *symptomatic* or secondary.

Accidental inflammations are those arising from *mechanical* causes, such as pressure, friction, cutting, and lacerating instruments, &c., or *chemical* causes, including all irritating, acrid, and corroding substances, high degrees of temperature, and great cold: all these causes excite inflammation in the part to which they are applied; but the inflammation arising from cold often manifests itself at a distance from the part on which the cold has acted. In accidental inflammations the local symptoms generally precede the constitutional, and the latter follow, with respect to their increase or decline, the course of the former.

Spontaneous or Idiopathic Inflammations are those which cannot be distinctly traced to the action of any external agent, and appear to derive their origin from various morbid conditions of the constitution, such as a state of general or local plethora, the over-excitement or deficient action of certain organs, &c. Spontaneous inflammations are susceptible of being influenced to a certain extent by peculiarities in the state of the atmosphere, the exact nature and mode of operation of which we are unable to explain. That such, however, is the fact is clearly proved by the circumstance of this class of inflammations assuming sometimes an epidemic form, which constitutes a good line of distinction from the preceding class.

Symptomatic or Secondary Inflammation.—It has already been observed, when describing the constitutional symptoms, that whilst inflammation was frequently a primary cause of great general disturbance in the animal economy, it was also on many occasions only symptomatic of a previously disordered state of the constitution; the inflammation appears then as a symptom only of another more general disease. Among the causes of symptomatic inflammations, one of the most frequent is the introduction into the system of poisons, such as those of variola, rubeola, scarlatina, &c. The patches of erysipelatous and gangrenous inflammation which appear in different and remote parts of the body after poisoned wounds, are merely symptomatic of the typhoid and malignant fever which is the primary and more immediate effect of the poison. The various cutaneous affections attending the febrile exanthemata are merely symptoms of a general disease, and do not constitute its essential features, as they are often very slight and sometimes even altogether wanting; the latter case constitutes a variety of disease described by nosologists as *variolæ sine variolis*, *morbilli sine morbillis*. The buboes of the plague afford another instance of symptomatic inflammation, and the various swellings and critical abscesses subsequent to continued fevers are of the same description. The paroxysms of some intermittent fevers have been attended with regular attacks of ophthalmia, diarrhœa, or dysentery. Erysipelas and anthrax are in numerous instances to be traced to a state of general repletion, combined with a vitiated condition of the blood and of all the secretions, and are accompanied by typhoid fever.

Symptomatic inflammation is of frequent occurrence also after the healing of large and long-established ulcers; after the removal of a limb, in a state of profuse suppuration in consequence of compound fracture; and particularly in cases of phlebitis, which are so often attended with the formation of abscesses in parts remote from the original inflammation. Symptomatic inflammation is attributed in general either to nervous sympathy or to a vitiated state of the blood. The absorption of pus and its combination with the blood is considered by some pathologists as the principal cause of the secondary inflammation and suppuration. It has been ascertained beyond doubt that pus is sometimes absorbed both by the veins and lymphatics, and circulated with the blood; it may be either the produce of the inflammation of the vessels themselves, as in cases of phlebitis, or be taken up by them from inflamed and suppurating parts. Pus has been found in the veins and lymphatics in the neighbourhood of diseased joints, of unhealthy stumps, of old ulcers, and of inflamed organs, such as the uterus, intestines, liver, and brain. Collections of matter have also been found, however, in these cases, in parts of the body remote from the inflamed organ; as, for instance, in the lungs, spleen, joints, serous cavities, and even in some of the muscles; and this has occasionally taken place without the least trace of any concomitant inflammation being discovered in these parts. M. Dance states, in his work on this interesting subject, that he has observed pus in the veins of the arm, on bleeding women affected with uterine inflammation and phlegmasia dolens. We have seen purulent deposits in several parts of the spleen of a man who died of fever soon after the healing of a large chronic abscess between the muscles of the thigh; the texture of the spleen was in every other respect perfectly healthy. Small collections of pus have been observed by Andral and Velpeau in the centre of the coagula of blood found in the heart and large vessels. (*Andral*, Pathol. Anat. transl. vol. i. p. 97.) It appears reasonable to conceive that the mixture of pus with the blood should become a source of irritation, as well as any other heterogeneous principle, and this may, therefore, be admitted as an occasional cause of symptomatic inflammation; it can scarcely, however, be considered as the only cause, since we have seen that these accumulations of pus sometimes take place as the effect of an ordinary process of secretion, and without any accompanying inflammation.

The absorption of pus was for a long time erroneously considered to be the primary cause of hectic fever. That this is a mistake is clearly proved by the fact that hectic fever is often induced by the long-continued irritation of vital organs, with very little or even the total absence of suppuration; while very extensive collections of matter may exist for a long time in parts of less importance without any hectic.

Symptomatic inflammation differs in most cases from spontaneous inflammation by following a fixed and regular course, and having always the same mode of termination, as is exemplified in the febrile exanthemata. Among the secondary inflammations may be included that of the pleura consequent upon the opening of a tubercle or abscess into its cavities, or that of the peritoneum from the perforation of the intestines, bursting of an hepatic abscess, or rupture of the uterus.

The division of healthy inflammation adopted by Mr. Hunter was the adhesive, suppurative, and ulcerative. He observed that in the cellular membrane, and all circumscribed cavities, the adhesive inflammation takes place more readily; whilst in internal canals, and all cavities having a communication with the exterior and which are lined with mucous membranes, the suppurative and ulcerative inflammation come on most readily, and the adhesive very seldom. Adhesions would in general prove hurtful in these membranes; and they only take place from very violent and long-continued inflammation.

Mr. James, in his work on inflammation, takes, as the basis of his division of inflammations, their disposition either to be *limited* by the effusion of organizable coagulable lymph, or to *spread*. This distinction appears founded in nature: for the common inflammation of the cellular membrane, and of parenchymatous and glandular organs, which is termed phlegmon, is generally circumscribed by the effusion of coagulable lymph; whilst in certain textures, such as the fibrous, inflammation shows a remarkable tendency to spread, assuming the character of erysipelas; and the same tendency seems also to be induced in all other parts of the body by a deficiency in the powers of the constitution; a certain degree of vital action being required for the production of coagulable lymph. The orders in Mr. James's division are established on the principle of the degree of connection of the organ with the vital functions of the animal; and the genera are founded on the original disposition of inflammation to have particular modes of termination, as, for instance, in boil and whitlow to suppurate, in carbuncle to slough, and in mumps to resolve; and this disposition, he justly observes, is so strong as to render it extremely difficult to procure any other termination.

One of the most usual divisions of inflammations with reference to their nature has been into *common* and *specific*. Common or healthy inflammation is that which usually follows the action of mechanical or chemical causes, of which phlegmon may be taken as the general type.

Specific inflammation is distinguished by certain peculiarities in its symptoms and progress, which are to be attributed either to a special morbid diathesis or to the specific nature of the exciting cause. Thus inflammation of the urethra from a mechanical cause is common inflammation; the inflammation from gonorrhœa is a specific inflammation. The principal varieties of specific inflammation are the *scrofulous*, *syphilitic*, *rheumatic*, *gouty*, *erysipelatous*, the *gangrenous inflammation*, produced by morbid poisons, or else by constitutional causes; the *unhealthy inflammation* that characterizes cancer and all new growths of a malignant description.

Scrofulous and syphilitic inflammation affect a variety of tissues at the same time; the peculiarities by which they are distinguished will be fully described in the articles SCROFULA and SYPHILIS.

Gouty, *rheumatic*, and *erysipelatous* inflammation will be described when treating of the modifications of inflammation by texture.

The peculiarities of the inflammation arising from animal poisons have been sufficiently detailed under the head *Constitutional Symptoms*;

and those belonging to cancer and other new growths of a malignant nature will be considered in a separate article.

Latent Inflammation.—It was observed, in the account of the constitutional symptoms of inflammation, that in some cases no inflammation exists, although many of its symptoms are present. It is a fact equally well established, that inflammation sometimes occurs, even to a considerable extent, without any indication of its existence from either local or general symptoms; or it very often happens that the more important are absent, and those which are recognised are insufficient to indicate the disease. Hoffmann was the first writer who noticed the latency of inflammation, and affirmed that he had found most intense abdominal inflammation without pain or sense of heat; and his observations were confirmed by subsequent writers. Baglivi states, "*Pleuritides frequenter sunt occultæ, quia indolentes, unde gravissimi errores in praxi succedunt.*" (Prax. Med., lib. i.) Stoll has also given an interesting account of an epidemic fever, the chief character of which was a latent peripneumony; and in his *Ratio Medendi* a description is given of other forms of latent inflammations.*

Modern pathologists have confirmed the frequency of latent inflammatory diseases, the detection of which is now rendered more easy from the various improvements which have been recently made in diagnosis, more especially in the physical signs of diseases.

It is very difficult to account for the occurrence of inflammation without its characteristic signs; for not only is this latency observed in structures in which the sensibility is dull, but in those in which, under inflammation, it is most exquisite, as in pleurisy and peritonitis. It has been remarked by many practical writers that the condition of the nervous system has a material influence in obscuring local inflammations; this is more especially the case in continued fevers, in which the various local inflammations are rendered latent in proportion to the degree of affection of the nervous system. This, however, is not the sole cause, for cases of latent inflammation constantly occur where the nervous system is comparatively little if at all affected; it is important, however, in fever with moderate or severe cerebral affection, that the state of the various organs should be carefully examined, in order to discover the existence of organic inflammation.

It is also well known that some tissues, such as mucous membranes, may undergo inflammation, and even changes of structure consequent thereon, without pain or other local indication of disease, although the constitution sympathizes powerfully with the inflamed organ. We have an instance of this in the equivocal nature of the symptoms of inflammation of the mucous membrane of the intestines, and in the latent symptomatic bronchitis of fever. Again, the progress of chronic inflammation is sometimes so slow and gradual that both the organ affected and the constitution become accustomed to it by insensible degrees, and even accommodate themselves to the impediment of function the lesion induces. Even the brain, which is the organ from which sensibility is derived, affords an illustration of this pathological fact, as local or partial inflammation of this organ may exist, and be proceeding to disorganization of its structure without urgent symptoms. In such cases not only are the more prominent signs, such as pain in the head, sense of weight, or vertigo, absent, but the mental powers are often scarcely affected, or only to a very slight degree, and the attention of the patient and his physician is perhaps for the first time awakened to the danger of the disease by some sudden seizure which rapidly destroys life.

Latent inflammation of the lungs has been alluded to as of frequent occurrence in continued fever, and would be frequently entirely overlooked, were the practitioner to trust entirely to the absence of the ordinary symptoms. In these cases auscultation seldom fails to detect the existence, nature, and extent of the pulmonary disease, which is often the chief source of danger. It is a well-ascertained fact also that partial or circumscribed pneumonia, catarrh, or congestion of the lungs, may exist for a considerable time without any perceptible change in the general health. If these partial chronic affections of the pulmonary organs be neglected, they often lay the foundation of more extended and dangerous disease; in such cases the value of auscultation must be admitted by the most sceptical.

Equally uncertain are the symptoms of several intestinal lesions, gastro-enteritis, and hypertrophy, and ulceration of the mucous follicles; so fallacious indeed have the symptoms of these lesions proved, that pathologists despair of fixing on their peculiar pathognomonic signs.

Chronic inflammation and even suppuration of the glandular organs of secretion, the liver and kidneys, chronic diseases of the heart, pericardium, and large vessels, originating primarily in inflammation, are among the latent affections discovered only after death.

Latent inflammation of the lungs or liver sometimes succeeds to capital operations, such as lithotomy or amputation, and to severe injuries of the head. We have already alluded to the non inflammatory purulent deposits observed in organs after severe surgical diseases or operations.

These facts, connected with the occurrence of latent inflammation, show the necessity of careful investigation into the history of each case in which there is the slightest suspicion of latent disease going on in any organ essential to life. In the absence of external or evident symptoms, physiological examination may often assist the practitioner in its detection, more especially in those organs which cannot be brought under ocular or manual inspection. For example, chronic diseases of the brain may often be discovered by imperfection in the performance of its several important functions. In pulmonary inflammation, the state of the respiration as to the frequency and regularity, the nature and intensity of the sounds elicited by auscultation, and the character of the expectoration, afford important guides. In intestinal inflammation, inquiry as to the presence or absence of pain, the condition of the tongue, the frequency and character of the alvine evacuations, and the other modes of exploration of the abdomen, are never to be omitted.

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* A good account of both latent and symptomatic inflammations is given in the article *Inflammation* in the *Dictionnaire de Médecine.*

It must, however, be admitted, that even with the most minute and careful investigation, latent inflammations elude observation, and tend much to impress on the reflecting mind the diffidence with which we should pronounce the existence or non-existence of organic lesions during life, unless they are accompanied with such manifest signs as to render their existence and nature perfectly unequivocal.

Varieties of inflammation according to texture.—While the study of the healthy structure of the separate textures of the body has materially contributed to the improvement of physiological science, the great attention paid of late years to the diseased structure of the different animal tissues has led perhaps more than any other circumstance to a similar rapid advance in our knowledge of pathology. The merit of having first pointed out the advantages that might be obtained from investigating the modifications induced by disease in the structure of the part affected, and of making the animal tissues the basis of a new nosological arrangement, is attributed on the continent to the celebrated Pi[illegible] We have before observed, however, that the writings of William Hunter, Cullen, and John Hunter contain many allusions to the striking differences several tissues present in their diseased structure; and that Dr. Carmichael Smith published an admirable paper in 1788, in which this learned physician took a comprehensive view of the peculiarities of inflammation as they are observed in the different sorts of organic substance found in the animal body.

We proceed to give an account of the changes of structure induced by inflammation in the principal tissues, and acknowledge the valuable information we have received on this important subject from the excellent work of Gendrin. We have consulted also, with much advantage, the works of Laennec and of Andral, and the valuable *Elements of General and Pathological Anatomy* of Dr. Craigie.

1. *Cellular tissue.*—The two most obvious properties of the cellular tissue in health are its expansibility and elasticity. When examined after the full development of active inflammation and before suppuration has taken place, it is found inexpansible, hard, and easily broken down; its areolæ are filled with a red homogeneous, opaque, gelatinous-like matter, with which it is so firmly incorporated that it cannot be removed by ablution. The density and infiltration decrease from the centre of the inflammation; the redness also gradually lessens in intensity, but the vessels are enlarged, very minutely injected, and distended with blood. Where the redness disappears, the tissue has preserved its elasticity, but is filled with a yellowish serous fluid forming a greater or less degree of œdema, according to the laxity of the tissue and depending position of the part. When the inflammation has been violent, there are found in the central portion, besides the sanguineous infiltration, small cavities filled with black extravasated blood, mixed sometimes with serosity, or broken-down fatty and cellular substance, or a puriform fluid. When these cavities are numerous, or when large and attended with extensive disorganization, there is a great risk of mortification.

If the part affected contains much of the vesicular adipose tissue, it will be variously affected acccording to the degree of the inflammation; when moderate, the fat is mostly resorbed; but if intense, it is broken down, mixed with the blood, and converted into a yellowish and pultaceous matter. The preceding morbid alterations constitute what is termed by Gendrin the *red infiltration*. As the inflammation proceeds towards suppuration, the redness gradually decreases, and is only very slight after the secretion of pus has commenced. The cellular tissue then becomes softer and spongy; the sanguineous infiltration is succeeded by that of a yellow puriform fluid; and this constitutes the *yellow infiltration*.

When the suppuration is completed, the pus collects into one or several cavities; the walls of these cavities are lined by a condensed layer of red and vascular cellular substance; the swelling becomes more defined and circumscribed; the surrounding œdema diminishes, and a common abscess is thus formed.

The variety of inflammation just described is that belonging to common *phlegmon*, and is always circumscribed; it may take place in any part of the body, but some are much more disposed to it than others; it often occurs, for instance, under the jaw, in the axillæ, near the rectum or urethra, &c. Phlegmonous abscesses frequently appear after febrile diseases, particularly the exanthemata, and are generally considered critical.

There is another form of acute inflammation of the cellular membrane, differing chiefly from the preceding in not being circumscribed, but spreading by continuity without any regular limits, and which has received the name of *diffused inflammation*. This is a constant attendant of the erysipelas phlegmonodes, and is occasioned also by the inflammation of veins, by sprains and external violence, by the inflammation of deep-seated fibrous textures, and that of poisoned wounds. Although frequently combined with erysipelatous inflammation, it may exist without it, and generally terminates in diffused suppuration of several portions of the inflamed cellular tissue, and sometimes in sloughing. The first account of diffused inflammation of the cellular membrane as a separate disease was given by Dr. Duncan.

In *chronic* inflammation, the cellular tissue loses its elasticity, and becomes condensed and thickened by the uniform infiltration of a coagulated, albumino-gelatinous fluid, which fills its areolæ. It is difficult to divide with the knife, and not so easily broken down as in acute inflammation; in some cases the infiltration is of a greyish white, in others it has a red marbled appearance. The inflammation may either be circumscribed and terminate abruptly, or become diffused and surrounded with œdema. That peculiar affection of infancy called *the skin-bound disease*, originates in chronic inflammation of the cellular membrane. The whole surface of the body is swelled and hard, and the skin is cold and tight-bound. A similar disease has been sometimes observed in the upper and lower extremities of adults, especially in young women of a phlegmatic temperament, and is extremely difficult to remove.

Chronic inflammation of the cellular membrane may end in suppuration or ulceration. It never supplies perfect pus, but rather a sero-purulent viscid yellowish fluid, sometimes slightly tinged with blood; it shows no tendency to cicatrization, forming rather cold abscesses, fistulous canals, and chronic ulcers. The walls of the abscess are sometimes permanently organized, so as to be converted into a cyst.

Gangrene may be the effect of the intensity of the cellular inflammation. There is also a form which tends to destroy the vitality of the part from its commencement. This is either the effect of morbid poisons, or of an irritable and depraved habit of body; it is of frequent occurrence after poisoned wounds, and in some varieties of erysipelas, and constitutes the formidable disease termed *hospital gangrene*. The inflamed tissue becomes flabby, of a livid or black colour, intolerably fetid; and it finally separates from the living parts in the form of eschars. The moment the part has become gangrenous, all circulation, both in the blood-vessels and absorbents, ceases, and the vessels are obliterated: the truth of this, which was always taken for granted, has been fully demonstrated by a number of experiments performed by Gendrin.

Serous Membranes.—It is a well-established fact that a serous membrane and the organ it invests, may each be affected with inflammation separately, although in perhaps the majority of cases the inflammatory action extends more or less from the one to the other. The serous membranes are connected with the textures which they either line or invest by a cellular tissue of different degrees of density, and it is not always easy to ascertain the exact line of separation between the serous membrane and the subjacent cellular tissue, in consequence of the great similarity of their texture. This is an important consideration in deciding upon the thickness of serous membranes; for where the sub-serous tissue is loose and abundant, a considerable portion of it may be raised with the membrane, and add apparently to its thickness. Gendrin has given the best explanation of the causes of thickening in serous membranes. Some pathologists have denied that they are ever really thickened; but this is a mistaken assertion, as is rendered particularly evident by the changes induced by chronic inflammation.

The sub-serous cellular tissue always participates in the inflammation of serous membranes, and traces of the inflammation are observed in this tissue, before the substance and free surface of the membrane are at all affected. The first changes induced by inflammation are a red injection and serous infiltration of the connecting cellular tissue, which loses its elasticity and is easily torn; sometimes globules of air have appeared, forming a slight degree of emphysema. When the inflammation has lasted some time, this serous infiltration penetrates between the laminæ of the serous membrane, causes a real increase of thickness, and renders it opaque. These changes are greater where the membrane is connected to the adjacent part by an abundance of loose cellular tissue, as is the case with the portion of arachnoid covering the brain, than where this tissue is very close and firm, as in the portion of the arachnoid lining the dura mater. The degree of facility with which inflammation is propagated from serous membranes to the adjacent parts, and *vice versâ*, depends also, in a great measure, on the density of the sub-serous cellular tissue, and on its penetrating more or less into the texture of the subjacent organs.

The inflammation of serous membranes exhibits, therefore, in the beginning, patches of a uniform bright red, confined to their adherent surface, and to the subjacent cellular tissue, which is infiltrated with serum. As the disease advances, the free surface of the membrane becomes dotted with small red points, and overrun with minute red streaks; the vessels, which before conveyed only a colourless fluid, beginning to admit red blood. The red patches gradually spread and unite together, and the number of red dots increases, resembling very small petechiæ; in some cases they are much larger and stellated, constituting patches of ecchymosis. The membrane in the intervals is white and opaque, and there is a sensible increase of its general thickness, arising from the infiltration of serum between its laminæ.

Some serous membranes are but very slowly injected in inflammation, and sometimes even not at all, as for instance the arachnoid; but as soon as the subjacent cellular tissue becomes red and filled with serosity, the membrane loses its transparency, assumes a milky-white appearance, and is increased in thickness.

In cases of simple congestion, all the vessels of the sub-serous cellular tissue are very minutely injected, and sometimes a few of the vessels of the membrane itself; and the great vascular injection seen through the transparent membrane has occasionally been mistaken for inflammation. The redness, however, can easily be removed by pressure and ablution; there are no permanent red dots or patches of ecchymosis; the membrane is neither thickened nor opaque; there is either no sub-serous effusion, or, if any, it is very slight, and the fluid not coagulated. It is necessary to remark that, when the redness of inflammation is only slight and of recent date, it often disappears partially after death.

One of the effects of commencing inflammation in a serous membrane is an increase of secretion, and the effusion of a serous fluid, at first limpid, and of a citron or reddish colour. This fluid contains a small proportion of albumen, which increases when the inflammation is severe, and it bears a strong resemblance to the serum of the blood. When the inflammation is only moderate or partial, the fluid may be absorbed almost as fast as it is effused, so that there is little or no accumulation. The surface of the inflamed membrane has been sometimes found unusually dry, although highly inflamed. This has occurred in cases of arachnitis, pleurisy, and pericarditis, in which the inflammation was very intense and proved rapidly fatal.

As the inflammation increases, and particularly if intense, all secretion is suspended, or it consists only of a very small quantity of bloody serum or of pure blood, as is seen occasionally in the arachnoid, pleura, and peritoneum: the effusion of blood has been sometimes very copious in pleurisy and peritonitis, and described as hemorrhagic inflammation. It is the constant effect of violent inflammation to stop both exhalation and absorption. We have stated already, when treating of congestions, that large effusions, not purulent, are more frequently the produce of congestive irritation than that of active inflammation. When the inflammation abates, if, instead of ending in resolution, it is disposed to pass into the chronic state, the effusion then increases considerably, and, losing its limpidity, consists of a mixture of pus and serum: the pus is yellow or greenish, and sinks to the bottom. It is important, therefore, to remember that the period of decline of the inflammation of serous membranes is always attended with the danger of increased effusion. There is sometimes exuded, chiefly on the surface of the arachnoid, a layer of thick green pure pus, without any serous fluid or plastic coagulable lymph, and adhering but slightly to the surface of the membrane: this has been also observed, though more rarely, in the peritoneum and pericardium. Pus is effused also in the sub-serous cellular tissue; and this is the most usual form of suppuration in the arachnoid; as pus is but seldom poured out from its free surface. In the other serous membranes, on the contrary, pus is more frequently exuded by their free than by their adhering surface. The greater looseness and vascularity of the sub-serous cellular tissue in the arachnoid may account for this difference. The serous fluid effused beneath the arachnoid, and in the pia mater, has a gelatinous appearance, and consists of coagulated albumen, combined with various proportions of serum according to the intensity of the inflammation; in some cases, one part of the effusion having been absorbed, the remainder becomes circumscribed in cavities formed by false membranes.

The surface of an inflamed serous membrane soon becomes covered, wherever the inflammation extends, with a very thin layer of an apparently albumino-gelatinous substance; when this is removed, the membrane is found to have lost its smooth polish, and appears rough. This deposit gradually becomes thicker and more adherent, and forms the rudiment of a false membrane: it is almost always accompanied with a serous or sero-purulent effusion; but in some rare cases the effusion has been wanting. This organizable matter has been found by the experiments of Dowler and Lassaigne to consist of two parts; one concrescible and adhesive, formed of fibrine; the other fluid, and contained in the cells of the former, consisting of albumen; it constitutes what is generally known as coagulable lymph, and by undergoing certain modifications is converted into pus. When adventitious membranes do not become organized, Laennec says they are generally softened down into pus. There is a greater disposition to the formation of false membranes in the serous than in any other tissue of the body. The coagulable lymph is variously disposed; when exuded in considerable quantity, portions of it are generally separated from the surface of the membrane, and float in the shape of flocculi in the sero-purulent effusion, giving it a turbid whitish appearance, especially in the abdomen; from which circumstance arose the old opinion, that the effusion of this fluid in puerperal women was owing to the metastasis of the milk.

The lymph is sometimes deposited in the shape of small globules studding the membrane; at others it forms papillæ symmetrically arranged, or assumes a granular or a reticulated appearance; this is generally the case in the pericardium. The organizable matter itself is porous and cellular, containing a fluid that may be expressed by pressure. The soft portions of coagulable lymph that adhere to the opposite surfaces of the serous membrane, following the movements of these surfaces in the cavities of the thorax and abdomen, are drawn out into filaments, lamellæ, or cords, which, becoming organized, constitute cellular adhesions; their organization takes place in the following manner: the false membrane gradually becomes denser and more adherent, in consequence of the absorption of its thinner portion, and at last exhibits traces of commencing organization by becoming injected with blood. How to account for the presence of the blood is an interesting subject of inquiry, which has excited much discussion: it must either be brought by the vessels of the serous membrane which shoot into it, or else be spontaneously formed in the original lymph. Gendrin relates some interesting microscopic observations in support of the former opinion, for which we must refer the reader to his valuable work, not having space to quote them. (Histoire Anatomique des Inflammations, vol. ii. p. 551.) Laennec and some other pathologists, have adduced, however, facts that seem to prove beyond all doubt that coagulable lymph possesses an independent vital property, in virtue of which it becomes organized. Laennec has shown that portions of exuded fibrine perform the functions of secretion, absorption, and nutrition, before the slightest trace of any vessels can be discovered in them; for in some cases of peritonitis and pleurisy he found that the exhalation and absorption of serous fluids took place to a considerable extent between the layers of coagulable lymph, before they were organized; and that one layer of lymph is moreover capable of secreting another, as proved by a case he published in the *Journal de Boyer* for the year 1801. The fluids, therefore, under the influence of some vital impulse, must make channels for themselves in all directions between the fibres and laminæ of the lymph; this process is justly compared by Andral to the life of some zoophytes composed of an amorphous mass of gelatine, who absorb, digest, excrete, and are nourished, although they do not present any vestige of regular organization. Serous fluids and collections of well-formed pus and of calcareous matter have been found in the centre of masses of coagulated fibrine, by Andral, Velpeau, and several others, showing that it was susceptible also of morbid irritation. The development of various new morbid growths may, no doubt, be accounted for on the same principle.

The first traces of organization in the coagulable lymph are the appearance of a few red dots, resembling small collections of blood, and analogous to the *punctum saliens* in the vitellary membrane of the chick, the fibrine being endowed with a similar property of secreting red blood. Sometimes there are red lines or furrows running in various directions and anastomosing, so as to form meshes and net-works; and at a later period we find distinct blood-vessels, through which the blood regularly circulates. The globules of the blood probably move about in various directions, tracing passages for themselves through the lymph, until regular vessels are thus formed; or else the small trains of coagulated blood become converted into vascular tubes. Laennec states, that on examining these trains of blood, he has found them to contain small white cylindrical filaments of fibrine, permeable in the centre and containing blood, and which he considers to be the rudiments of vessels. Some of the branches of this independent circulating system finally inosculate with the vessels of the adjoining tissues. The vessels formed in a clot of blood have been successfully injected by John Hunter and Sir E. Home, as may be seen in some beautiful preparations in the museum of the London College of Surgeons. It is in the inflammation of blood-vessels that the various transformations the fibrine undergoes can be the most accurately traced.

As soon as a regular circulation of blood has been established in the mass of coagulated lymph, it begins to lose its homogeneous nature, and may assume a laminous, cellular, mucous, or fibrous texture, analogous to the structure of the tissue by which it has been supplied; the nervous and muscular tissues form the only exception. In serous membranes the filaments and lamellæ of soft lymph, after being highly injected, gradually shrink into thin transparent laminæ, until their redness and vascularity entirely disappear, and they assume the exact appearance of a portion of cellular or serous tissue; these new textures are found to be provided with blood-vessels, lymphatics, and nerves; and this affords a striking proof of the independent vitality existing in each particle of living matter. The preceding is the mode of formation of all cellular adhesions. As soon as the false membrane begins to be organized, it may become the seat of inflammation, exude on its surface soft organizable lymph, similar to that from which it has derived its origin, and undergo various transformations exactly in the same manner as any other tissue. It is evident, from what has been just stated, that the two opinions respecting the formation of false membranes may both be admitted; that there are first currents of blood traversing the coagulated lymph without vessels; that there are vessels formed independent of any communication with adjoining parts; and that some of these vessels finally anastomose with the vessels of the surrounding parts, so as to connect the circulation of the new tissue with that of the system. The period at which false membranes become vascular varies; numerous vessels have been seen on their surface twelve hours after their formation, and in other cases they have remained several months without presenting any trace of organization.

The alterations of structure produced by *chronic* inflammation in serous membranes differ from those of acute inflammation rather in degree than in kind; the transition, indeed, from the one stage of inflammation to the other is in general very gradual, and there are often intermediate and mixed cases, which it would be difficult to refer exclusively to either.

The redness is generally less, and inclines to a dark brown; the principal difference consists in the increase of thickness and density of the membrane; the sub-serous cellular tissue, which is completely filled with albuminous fluid, has become so identified with the membrane on the one side, and portions of false membrane are often so firmly connected with its free surface, that when the membrane is raised, its thickness and density appear considerably augmented. We have preserved portions of arachnoid membrane, which had been long exposed to chronic inflammation, fully as thick as common parchment. There are sometimes patches of a pearly white, perfectly opaque, and of a greater thickness and firmness than the rest of the membrane.

One of the alterations peculiar to the chronic inflammation of serous membranes is a rough granulated appearance of their surface, well described by Gendrin; these granulations are but slightly raised, white, irregularly dispersed, imbedded in the substance of the membrane, and are sometimes intermixed with a number of brown dots: the granulated bodies are firm, and never soften down or suppurate. The surface of serous membranes is sometimes also studded with masses of tubercular matter, which may acquire a considerable size; these tubercles are developed either in the substance or on the surface of the membrane, but generally in connection with adventitious membranes, and sometimes become softened. Tubercles are much more common in peritonitis than in pleurisy.

The effused fluid is mostly of a yellowish or milky white, and has a peculiar and sometimes fetid smell; it may contain portions of a flaky albuminous substance, mixed with pus, or be altogether puriform, or, as in the majority of cases, consist of a clear serum. It has been sometimes found entirely gelatinous, resembling a solution of isinglass. The quantity of effusion is usually so considerable as to distend the cavity in which it is contained, and compress the adjoining organs, as is seen in empyema and chronic peritonitis.

There are generally found false membranes, always completely organized, and in some cases very thick, and of a firm, fibrous, cartilaginous, or even osseous texture; these adventitious membranes are sometimes disposed in layers of different textures and degrees of density; they give the serous membrane an appearance of great thickening, which has not unfrequently been a source of deception; but on closer inspection the membrane will be found, beneath the adventitious tissues, not very materially altered. In some cases numerous adhesions are found, with an infiltration of pus between them; and when this occurs in the thorax, its cavity may become contracted, especially if, as occasionally happens, the pus makes its way by a fistulous opening to the surface. The cavity lined by the serous membrane may also be completely obliterated by a mass of adventitious tissue of a dense, indurated, fibrous nature, or else spongy, cellular, and filled with an albumino-gelatinous matter: this adventitious tissue is sometimes separated from the serous membrane by a thin stratum of soft lymph, especially when death has been occasioned by an attack of acute inflammation.

These firm and completely organized adventitious textures always indicate the pre-existence of acute inflammation. When an acute attack has supervened on chronic inflammation, the false membranes are found, as well as the serous membrane, of a vivid red, and covered with newly effused coagulable lymph or fresh pus, which are the products of the recent inflammatory action; Gendrin states that it is sometimes possible to ascertain when there has been more than one attack of acute inflammation, by the different degrees of organization of the newly-formed tissues. The fatal termination of chronic inflammation is to be attributed in the great majority of cases to the supervention of acute inflammation.

The serous membrane is sometimes found perfectly black, in consequence of the extravasation and infiltration of blood; this is the effect of an hemorrhagic congestion occurring in the course of chronic inflammation; besides the large spots of ecchymosis on the surface of the membrane, there is generally an effusion of blood into its cavity, which is mixed with the pus or serous fluid it already contained; these appearances could scarcely be mistaken for gangrene. Hemorrhage is not an unfrequent accompaniment of pleurisy, both acute and chronic; it is supposed to be occasionally the result of the rupture of some of the delicate vessels of the false membranes; the effusion is in general considerable, and causes the inflammation to become chronic. Laennec conceives that this mixture of blood and coagulable lymph favours the formation of fibrous and cartilaginous adventitious tissues, and states that he has observed in such cases a layer of dense membrane lining the costal and pulmonic pleura, and united by a third layer of a soft, gelatinous, semi-transparent substance.

Chronic inflammation has sometimes subsided, leaving the effusion behind it. This is rather a rare occurrence, as the effusion general disappears with the inflammation. There are, however, some instances of ascites and hydrothorax subsequent to peritonitis and pleurisy, and other cases, perhaps more numerous, of hydrocephalus succeeding chronic arachnitis in children. When the effusion has remained a considerable time, all traces of inflammation in the solids may have been removed. It should, however, be kept in mind that simple effusions are more generally the effect of active congestion than of acute inflammation. Chronic inflammation of serous membranes is often attended with swelling, induration, and suppuration of the neighbouring lymphatic ganglions.

There are no cases on record of the specific *gangrenous* inflammation of serous membranes. When affected with gangrene, it is always the consequence either of the violence of the inflammation of the membrane itself, or of the gangrene of adjacent tissues, such as, for instance, the bursting into the cavity of the pleura of a gangrenous abscess of the lung, and does not therefore require any separate description. The same may be said with respect to ulceration.

The Skin.—The two organic textures of the skin, the dermis and rete vasculosum, may be separately affected with inflammation. The rete vasculosum (or corpus mucosum) is sometimes the chief seat of the inflammation, as is exemplified in erysipelas, the exanthemata or eruptive fevers, and the scaly, vesicular, and papular cutaneous eruptions. This will be described under the generic name of *erythemoid or diffuse inflammation*. The rete vasculosum and external surface of the dermis may be jointly inflamed, and an eruption of pustules or tubercles, often followed by ulceration, take place, as in variola, vaccinia, and other pustular and tubercular cutaneous diseases. This will constitute the division of *pustular inflammation*. Or the substance of the dermis itself may be the chief seat of the inflammation, which often extends in this case to the subcutaneous cellular tissue, of which furunculus, anthrax, &c., are examples. This will form a third division into *inflammation of the dermis*. We have followed in this respect the classification of Gendrin.

The inflammation, however, in each of these divisions is by no means always limited to the one texture, but, if very acute or of long duration, extends to the others, as might naturally be expected, considering the intimate connection existing between the different parts of the skin. Cutaneous affections often undergo in this manner great modifications in their appearances, one form of disease assuming in succession the characters of several others, or there being mixed cases; this will account for the great difficulty often experienced in assigning with accuracy every case to its proper class in the nosological arrangements of cutaneous affections.

Acute erythemoid inflammation comprehends the inflammation arising from blisters, burns, erysipelas, scarlatina, rubeola, &c.; it is almost always more or less diffused, and characterized in its commencement by a bright uniform fiery redness of the surface of the skin, called rubefaction; the exhalation being suspended, there is a dry burning heat, and also a very slight degree of tumefaction, perceptible only to the touch. If the inflammation increase, the epidermis becomes detached and raised, either in large bullæ and phlyctenæ, or small vesicles, by the effusion of a limpid yellowish serosity. When the epidermis is removed, the inflamed surface appears of a rosy tint, slightly yellow: it is covered with red streaks, is rather tense, and exquisitely painful; small drops of limpid serum are constantly exuding. If the inflammation subsides at this period, the redness, pain, and serous secretion diminish, and the surface becomes covered with a pellicle of soft plastic lymph, which is gradually converted into a new cuticle. When the inflammation has been violent and the epidermis detached, a thick layer of a white concrete viscid lymph is sometimes found under it, as is seen in burns and blisters.

When the inflammation ends in resolution, without phlyctenæ or vesicles, the epidermis often falls off in small furfuraceous scales, under which a layer of new epidermis of a shining bright or violet red has been formed, and which does not assume its natural colour until after some time, as is exemplified in rubeola and scarlatina.

If the inflammation, however, is intense and prolonged, there is poured out a reddish serum, which gradually becomes turbid, sero-purulent, and at last completely purulent. When suppuration is fully established, the inflamed surface is of a bright red, has a rugous or villous appearance, and portions of lymph are sometimes exuded along with the pus. As the inflammation and suppuration diminish, the small granulations, which resemble those of common wounds, gradually become lined with a thin pellicle constituting the new epidermis.

Intense inflammation of the rete vasculosum extends frequently to the dermis and subjacent cellular tissue, as is seen in the erysipelas phlegmonodes and in severe burns; the skin is then tumefied and tense, and its redness does not disappear on pressure. The dermis and subjacent cellular tissue are injected with a red gelatinous fluid, and there are sometimes spots of ecchymosis or of extravasated blood on the surface. The inter-areolar adipose substance is absorbed: the texture of the dermis has lost its elasticity, is easily lacerated, and appears as if carnified. There is sometimes extensive suppuration and sloughing of the cellular tissue. These are the various appearances presented by the skin in erythemoid inflammation, from the slightest to the most intense erysipelas.

If the skin has been slightly inflamed just before death, every trace of inflammation disappears in a few hours after death. At a later period, however, Gendrin states that the portion of skin which was inflamed is found in a state of passive congestion, and the epidermis becomes sooner detached by putrefaction than in other places. But when the cutaneous inflammation has been at all severe, the rete vasculosum always continues much injected after death, and there is sometimes also a certain degree of sub-cutaneous œdema. A few days after death the injection and œdema are considerably increased by cadaveric congestion, which might lead to the belief that the inflammation had been much greater than it really was; this arises from acute inflammation increasing the tendency of the solids to putrefy, by lessening their force of cohesion.

The inflammation which gives origin to pustules (*pustular inflammation*), is of a phlegmonous character, each pustule bearing a considerable resemblance to a small phlegmon. They make their appearance first by small red dots, which increase gradually to round spots of a bright red, a little raised in the centre, giving a feeling of roughness or rugosity to the skin; the swelling of these spots goes on increasing until they form small, round, firm, red tumours, imbedded more or less deeply in the dermis, each tumour being surrounded by a red areola. The progress in the development of these pustules is very variable, being in some diseases fixed and regular. They differ also in their form, structure, and mode of termination. Some, as variola, are flattened, have several cells, and are depressed in the centre, the depressed part being attached to the dermis by one or several small white fibrous connections.

An eruption of acute pustules is also occasioned by the application of a variety of irritating substances, and particularly of tartar-emetic ointment and mercurial plasters: they are small, depressed in the centre, and have only one cell containing a little pus. Pustules may be either disposed in groups or irregularly scattered over the body: some varieties are acuminated instead of being depressed at their apex. Pustular diseases of a chronic character will be considered under the head of *chronic pustular inflammation*.

Inflammation of the *dermis*, *corion*, or *cutis vera*, includes chiefly two varieties of disease—*furunculus* and *anthrax*: the dermis is undoubtedly the principal seat of the inflammation in these affections, although it extends in general more or less to the subjacent cellular tissue.

Furuncle commences with a pimple in the skin, which gradually increases until it forms a small tumour of a conical shape, with a pustule on its apex, and generally very hard; it is of a bright or dark red, accompanied with burning heat, and excessively painful. The vascular and cellular processes that fill the areolæ of the dermis appear to be the primary seats of this inflammation, which afterwards spreads to the surrounding parts; it terminates in suppuration, and in the expulsion of a small body called *core*, after which the little abscess heals in the usual manner.

Cores have generally been considered as portions of cellular tissue which have mortified, in consequence either of the violence or unhealthy character of the inflammation; and this appears the more probable, that a fetid and unhealthy pus is discharged from the abscess with them. Gendrin, however, is of opinion that cores are not sloughs, but a morbid secretion or pseudo-membrane, the product of the inflammation of the inter-areolar cellular processes. As they become enlarged, they distend the fibrous sides of the areolæ, creating great tension and a certain degree of strangulation; they act as foreign bodies in exciting considerable inflammation in the sides of the areolæ; these are at first in a state of red infiltration, and adhere firmly to the cores; but as suppuration advances, the latter are gradually loosened and finally expelled. Gendrin states that cores consist of a viscid semi-transparent homogeneous yellowish white substance, and that he has never been able to discover in them any vessels or the least appearance of organization. The opinion of so accurate a pathologist is entitled to considerable weight, and should not be rejected without further careful investigation of the subject.

There is considerable analogy between the anatomical characters of *anthrax* and *furuncle*; the former is, however, a much more extensive and severe disease; it occurs generally at a more advanced age, is connected with a vitiated state of the constitution, and sometimes with the existence of a morbid poison in the system, as, for example, in pestilential fevers. Gendrin considers anthrax to differ only from furunculus in the circumstance of a number of the areolæ of the skin being affected with inflammation instead of one, and he states that he has seen the portion of affected skin pierced in this manner with a great many holes. There is evidently, however, mortification of several portions of skin and cellular tissue, besides a new inflammatory deposit.

Anthrax commences, like furuncles, with a small pimple, which extends rapidly both in breadth and depth until it forms a large flat tumour, only a little raised above the surface of the skin, and extending under it into the cellular tissue; it is nearly immovable, very hard and painful, of an intensely burning heat, and of a deep but rather dark red; it feels like brawn, is distinctly circumscribed, and its surface is covered with livid pustules or vesicles; as the disease advances, the skin mortifies in the centre and ulcerates at the circumference; a fetid unhealthy pus is discharged, and after a considerable time and much suffering a large slough is separated, consisting apparently of the union of several sores, and completely sodden with pus. When the slough is removed, there remains a large ulcer, which heals by a slow suppurative process.

There are three varieties of anthrax: one benign and mild; another malignant, having a greater disposition to mortification, of which the anthrax of the plague is a good instance; and one variety of a chronic character, similar to chronic furunculus. The lymphatic glands in scrofulous subjects sometimes undergo a sloughing inflammation called glandular anthrax.

We have examples of *chronic erythemoid inflammation* in chronic erysipelas, old blisters, and many of the scaly, papular, and vesicular cutaneous diseases, such as lepra, psoriasis, icthyosis, lichen, prurigo, pemphigus, rupia, herpes, scabies, miliaria, and eczema. In those cases in which the epidermis is not raised into vesicles or bullæ, the surface of the skin is injected, of a dark red colour, not removed by pressure, dry, hard, rather thickened, and covered with a number of small red elevations like enlarged papillæ, which give it a rugous appearance; the epidermis falls off in scales which are frequently renewed, or it forms scabs, from which there sometimes oozes a viscid puriform fluid having a disagreeable smell. When these scales drop or are removed, they are generally succeeded by others.

The epidermis is raised in other cases into vesicles, phlyctænæ, or bullæ, containing a yellowish serum. The fluid of the vesicles may be resorbed, so that the detached epidermis forms a thin scale which falls off, as soon as a new epidermis has been formed; or the fluid concretes into a scab, which is also removed after the formation of a new epidermis. There is frequently a succession of new vesicles and scabs on the same part. The denuded skin under the phlyctenæ and vesicles is injected, red, and sometimes supplies a series of scabs without healing. When blisters have been long kept open, or when the chronic inflammation has been severe, as in psoriasis inveterata, the texture of the dermis is much altered; it is thickened and injected with a gelatinous fluid of a yellow red, has lost its elasticity and density, being easily torn, and entirely deprived of adipose substance; the subjacent cellular tissue is also more or less thickened and œdematous. When the surface has been long denuded and suppurating, it is covered with soft, flabby, bleeding granulations of a yellowish red colour, and sometimes with layers of whitish concrete lymph, which is removed with the dressings. In ichthyosis the epidermis is enormously thickened, and acquires the hardness of horn; and in the common elephantiasis the dermis and subjacent cellular tissue are sometimes converted by the infiltration of an albumino-gelatinous matter into a new texture, thick, dense, homogeneous, and very like brawn.

Chronic pustular inflammation includes the various forms of impetigo, porrigo, ecthyma, acne, and mentagra, to which we may add the different kinds of tubercles into which the pustules frequently degenerate.

The pustules of these chronic cutaneous affections differ in their form, size, and situation; they are either large, acuminated, and with a hard and inflamed base, resembling in some cases small furunculi, as in ecthyma, impetigo, and acne; or they are small, round, granulated, and covered with thick scabs, as in porrigo; they may be dispersed over every region of the body, as in ecthyma and the impetigo sparsa, or be confined more particularly to certain parts, as in impetigo figurata, acne, and porrigo. Their first appearance is usually indicated by minute, red, itching spots, which are soon raised into small round tumours; they are at first hard, either red, or of the colour of the skin, imbedded in the rete vasculosum and generally also in the dermis; the rete vasculosum around them is deeply injected, and of a yellow red, and the injection extends in severe cases to the entire thickness of the dermis, and even to the subjacent cellular tissue.

The pustules quickly suppurate and then contain an opaque and viscid fluid, or thick pus of a peculiar and disagreeable smell, similar in porrigo to that arising from mice. The suppuration is followed by dessication and the formation of scabs; these are either thick, prominent, conical, and of a green or brown colour, as in impetigo figurata; or yellow, concave, and cupped, as in the porrigo favosa; or disposed in flat, irregular, lamellated masses, as in porrigo larvalis and lupinosa. When the part is thickly studded with small pustules, as in porrigo, the whole of the intervening skin is inflamed, tumefied, red, and excoriated, secreting a thick, purulent matter, which, uniting with the crusts of the pustules, forms large masses of thick scabs; there are often intermediate fissures in the scabs, through which matter is constantly discharged. The inflammation is attended also sometimes with abscesses of the scalp. The sebaceous follicles are considered by some to be the principal seat of the inflammation in acne and mentagra, and the bulbs of the hair, in porrigo. Syphilitic pustules are characterized chiefly by their copper violet colour and great disposition to ulcerate; they are also sometimes depressed in the centre or flat, especially in children. A detailed account of pustular affections of the skin will be found in the separate articles on cutaneous diseases.

Tubercles are larger and less inflamed on their first appearance than pustules. Some never suppurate, remain indurated and have but little vascularity, such as the verrucæ and moluscæ. Others, after acquiring a certain size, become inflamed, suppurate, are covered with thick scabs, and finally degenerate into unhealthy ulcers, which is the course of syphilitic tubercles. There are also a variety of fleshy excrescences and vegetations of the skin which may be considered as modifications of tubercular inflammation; they occur frequently after syphilis, and sometimes in scrofulous subjects; but occasionally also as a mere local affection.

Phagedenic inflammation of the skin is of a peculiarly malignant character; it leads to the formation of unhealthy ulcers, which spread more or less rapidly, destroying, by a process of suppumation and sloughing, the parts which they invade. It may affect almost every tissue of the body, but the skin is more subject to it than any other; it may supervene on other forms of inflammation, and sores of every description may assume a phagedenic character; this is more particularly the case with syphilitic and scrofulous ulcers, in which acute phagedenic inflammation is not unfrequently excited by the irritation of mercury. Phagedenic inflammation is sometimes idiopathic, especially in constitutions which have inherited either a scrofulous or syphilitic taint, or both.

There are two varieties of phagedenic ulcers, the *acute* and the *chronic*. In the *acute* the edges are swelled, inverted, jagged, and intensely red. The surface of the ulcer is of a fiery red, and discharges blood, accompanied with burning heat and extreme pain; it secretes a thin, sanious, acrid fluid. The acute phagedenic ulcer often spreads very rapidly, destroying the parts in some measure by a sloughing process. This form of phagedenic inflammation frequently occurs in scrofulous and syphilitic ulcers.

The *chronic* phagedenic inflammation of the skin commences generally by the development of small pustules, which soon degenerate into tubercles, the summits of which ulcerate; the edges of the ulcers are raised, indurated, of a violet red colour, less painful, and more circumscribed than in acute phagedena; the texture of the skin and subjacent cellular tissue is converted into a hard homogeneous substance resembling brawn; the bottom of the ulcer is of a dirty white, and covered with flabby granulations; the discharge is sero-purulent, fetid, and sometimes sanious. The secretion frequently concretes, forming thick hard scabs, under which the ulcer continues to extend; this form of phagedena spreads more slowly, but destroys with the same certainty as the acute; it enlarges chiefly at the circumference, while syphilitic ulcers have a greater tendency to extend in depth; it sometimes heals in the centre while spreading at the edges, and large soft vegetations arise occasionally from its surface; it varies in activity, being at one time indolent and at another more inflamed; the surrounding skin is often of a violet red, studded with hard tubercles or pustules of impetigo, and greatly predisposed to be affected with erysipelatous inflammation. After healing, these ulcers leave thick, red, and deeply furrowed cicatrices similar to those of burns.

The preceding form of phagedenic inflammation is principally observed in the formidable disease called lupus, and in the elephantiasis Græcorum.* There is a variety of phagedenic ulcer of the skin more superficial than the preceding, appearing in the form of tortuous lines or furrows, and called sometimes herpes serpens or exudens.

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In some very unhealthy constitutions, erysipelas occasionally assumes a gangrenous character from its first appearance; the inflammation is deficient in activity, and attended with considerable œdema the skin is of a livid or dark red, covered with a number of phlyctenæ, beneath which are observed black livid spots; the portions of skin thus affected soon mortify, and the gangrene spreads with rapidity, creating large sloughs both of the skin and cellular tissue. In some cases small ulcers appear on the surface, or collections of matter are formed in the cellular tissue, destructive suppuration being thus added to the gangrene.

The skin may also be affected with gangrene in consequence of the intensity of the inflammation, or from the direct action of irritants, such as intense heat, chemical agents, &c.: or finally from the benumbing effects of excessive cold.

A. C.

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tinctly circumscribed, and its surface is covered with livid pustules or vesicles; as the disease advances, the skin mortifies in the centre and ulcerates at the circumference; a fetid unhealthy pus is discharged, and after a considerable time and much suffering a large slough is separated, consisting apparently of the union of several sores, and completely sodden with pus. When the slough is removed, there remains a large ulcer, which heals by a slow suppurative process.

There are three varieties of anthrax: one benign and mild; another malignant, having a greater disposition to mortification, of which the anthrax of the plague is a good instance; and one variety of a chronic character, similar to chronic furunculus. The lymphatic glands in scrofulous subjects sometimes undergo a sloughing inflammation called glandular anthrax.

We have examples of *chronic erythemoid inflammation* in chronic erysipelas, old blisters, and many of the scaly, papular, and vesicular cutaneous diseases, such as lepra, psoriasis, icthyosis, lichen, prurigo, pemphigus, rupia, herpes, scabies, miliaria, and eczema. In those cases in which the epidermis is not raised into vesicles or bullæ, the surface of the skin is injected, of a dark red colour, not removed by pressure, dry, hard, rather thickened, and covered with a number of small red elevations like enlarged papillæ, which give it a rugous appearance; the epidermis falls off in scales which are frequently renewed, or it forms scabs, from which there sometimes oozes a viscid puriform fluid having a disagreeable smell. When these scales drop or are removed, they are generally succeeded by others.

The epidermis is raised in other cases into vesicles, phlyctænæ, or bullæ, containing a yellowish serum. The fluid of the vesicles may be resorbed, so that the detached epidermis forms a thin scale which falls off, as soon as a new epidermis has been formed; or the fluid concretes into a scab, which is also removed after the formation of a new epidermis. There is frequently a succession of new vesicles and scabs on the same part. The denuded skin under the phlyctenæ and vesicles is injected, red, and sometimes supplies a series of scabs without healing. When blisters have been long kept open, or when the chronic inflammation has been severe, as in psoriasis inveterata, the texture of the dermis is much altered; it is thickened and injected with a gelatinous fluid of a yellow red, has lost its elasticity and density, being easily torn, and entirely deprived of adipose substance; the subjacent cellular tissue is also more or less thickened and œdematous. When the surface has been long denuded and suppurating, it is covered with soft, flabby, bleeding granulations of a yellowish red colour, and sometimes with layers of whitish concrete lymph, which is removed with the dressings. In ichthyosis the epidermis is enormously thickened, and acquires the hardness of horn; and in the common elephantiasis the dermis and subjacent cellular tissue are sometimes converted by the infiltration of an albumino-gelatinous matter into a new texture, thick, dense, homogeneous, and very like brawn.

Chronic pustular inflammation includes the various forms of impetigo, porrigo, ecthyma, acne, and mentagra, to which we may add the different kinds of tubercles into which the pustules frequently degenerate.

The pustules of these chronic cutaneous affections differ in their form, size, and situation; they are either large, acuminated, and with a hard and inflamed base, resembling in some cases small furunculi, as in ecthyma, impetigo, and acne; or they are small, round, granulated, and covered with thick scabs, as in porrigo; they may be dispersed over every region of the body, as in ecthyma and the impetigo sparsa, or be confined more particularly to certain parts, as in impetigo figurata, acne, and porrigo. Their first appearance is usually indicated by minute, red, itching spots, which are soon raised into small round tumours; they are at first hard, either red, or of the colour of the skin, imbedded in the rete vasculosum and generally also in the dermis; the rete vasculosum around them is deeply injected, and of a yellow red, and the injection extends in severe cases to the entire thickness of the dermis, and even to the subjacent cellular tissue.

The pustules quickly suppurate and then contain an opaque and viscid fluid, or thick pus of a peculiar and disagreeable smell, similar in porrigo to that arising from mice. The suppuration is followed by dessication and the formation of scabs; these are either thick, prominent, conical, and of a green or brown colour, as in impetigo figurata; or yellow, concave, and cupped, as in the porrigo favosa; or disposed in flat, irregular, lamellated masses, as in porrigo larvalis and lupinosa. When the part is thickly studded with small pustules, as in porrigo, the whole of the intervening skin is inflamed, tumefied, red, and excoriated, secreting a thick, purulent matter, which, uniting with the crusts of the pustules, forms large masses of thick scabs; there are often intermediate fissures in the scabs, through which matter is constantly discharged. The inflammation is attended also sometimes with abscesses of the scalp. The sebaceous follicles are considered by some to be the principal seat of the inflammation in acne and mentagra, and the bulbs of the hair, in porrigo. Syphilitic pustules are characterized chiefly by their copper violet colour and great disposition to ulcerate; they are also sometimes depressed in the centre or flat, especially in children. A detailed account of pustular affections of the skin will be found in the separate articles on cutaneous diseases.

Tubercles are larger and less inflamed on their first appearance than pustules. Some never suppurate, remain indurated and have but little vascularity, such as the verrucæ and molusca. Others, after acquiring a certain size, become inflamed, suppurate, are covered with thick scabs, and finally degenerate into unhealthy ulcers, which is the course of syphilitic tubercles. There are also a variety of fleshy excrescences and vegetations of the skin which may be considered as modifications of tubercular inflammation; they occur frequently after syphilis, and sometimes in scrofulous subjects; but occasionally also as a mere local affection.

Phagedenic inflammation of the skin is of a peculiarly malignant character; it leads to the formation of unhealthy ulcers, which spread more or less rapidly, destroying, by a process of suppumation and sloughing, the parts which they invade. It may affect almost every tissue of the body, but the skin is more subject to it than any other; it may supervene on other forms of inflammation, and sores of every description may assume a phagedenic character; this is more particularly the case with syphilitic and scrofulous ulcers, in which acute phagedenic inflammation is not unfrequently excited by the irritation of mercury. Phagedenic inflammation is sometimes idiopathic, especially in constitutions which have inherited either a scrofulous or syphilitic taint, or both.

There are two varieties of phagedenic ulcers, the *acute* and the *chronic*. In the *acute* the edges are swelled, inverted, jagged, and intensely red. The surface of the ulcer is of a fiery red, and discharges blood, accompanied with burning heat and extreme pain; it secretes a thin, sanious, acrid fluid. The acute phagedenic ulcer often spreads very rapidly, destroying the parts in some measure by a sloughing process. This form of phagedenic inflammation frequently occurs in scrofulous and syphilitic ulcers.

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In the greatest part of its extent, mucous membrane consists of a spongy tissue, more or less soft, and varying very much in thickness: this is the mucous corion, on the surface of which the ultimate vascular ramifications of it are found. An epidermis or epithelium is very distinctly seen on this corion in some situations, that is, at the orifices of mucous cavities. It diminishes in thickness as we trace it from the origin of the mucous membranes, till in the more internal parts it eludes our observation; in fact the existence of the epithelium in the internal mucous membranes cannot be demonstrated.

Mucous membrane is especially remarkable for a series of mucous crypts or follicles, which are uniformly to be met with, varying, however, in number and arrangement in the different situations. An examination of the foramen cæcum at the base of the tongue and of the tonsillitic follicles will clearly expose their structure. In the gastro-intestinal mucous membranes they are found in great numbers, and under two different modes of arrangement: in the one case they are isolated and distinct from each other, (*glandulæ solitariæ,*) under which form they are chiefly met with in the large intestine; in the other they are deposited in clusters, (*glandulæ aggregatæ,*) and are to be seen chiefly in the small intestine, in the duodenum, and the colic extremity of the ileum.

Two varieties of eminences are found upon the free surfaces of mucous membranes; of these the most voluminous are called *papillæ*, of which the best-marked examples are on the tongue, glans penis, and clitoris. In parts provided with papillæ, the mucous membrane is furnished with a distinct epithelium.

The second class of eminences are the *villi* or *villosities*, which are found most prominent on the gastro-intestinal membrane. They are highly vascular, and the recent observations of Leuret, Lassaigne, and others, leave no doubt that in them the capillary extremities of the lacteals commence. They appear, therefore, from this fact, as well as from other considerations, to be materially connected with the absorbing function. The pathologist should bear in mind that these minute bodies may be injected with equal facility either from the arteries or mesenteric veins, which latter, being destitute of valves, permit the injected fluid to pass in a retrograde direction.

The healthy colour of those portions of the mucous system which are near to the orifices, is so obvious to the most superficial observer as to render any remarks upon it unnecessary. The natural colour of the more deep-seated portion varies in infancy, adolescence, and old age. At the former, it is transparent or of a rosy white colour; at the latter age, it is of a dull white, but retains a slight rosy hue; in old age, it becomes ash-coloured. The process of digestion increases the rosy colour of the membrane, and sometimes, especially with young subjects, induces a cherry red colour, obviously by increasing the flow of blood to it. Gendrin has found that fasting for any length of time also has the effect of heightening the colour of the membrane, which may be removed by nourishing the animal.

That the kind of death, moreover, has considerable influence upon the colour of the membrane is obvious, as in cases of death from chronic disease, from anæmia, and from asphyxia. Lastly, Gendrin found the mucous membrane increased in colour during the traumatic fever succeeding to a severe wound inflicted on an animal.

1. *Acute Erythemoid or Diffuse Inflammation.*—A change of colour is the most prominent mark of inflamed mucous membrane, occasioned by an increased vascular injection of those portions of the membrane to which irritation has been applied. This change of colour varies in extent and intensity, the membrane exhibiting either slight and superficial arborescent networks of an arterial red colour, or uniform spots, either red, brown, or black, and occupying the whole substance of the membrane.

The many varieties of vascular injection which mucous membrane in general, but that of the alimentary canal especially, presents, render it a matter of moment to determine, with as much precision as possible, those signs which characterize the vascularity of inflammation. Pressure diminishes the natural redness, or that of congestion, but does not produce that effect on the colour of an inflamed part. If the inflammation have existed for even a short time, maceration does not cause the redness totally to disappear, and those who are in the habit of making morbid preparations know how well the inflamed membrane exhibits its vascularity when dried and varnished, as if the inflammation had excited a greater degree of cohesion between the blood and the coats of its containing vessels.

In the highest degree of inflammatory action, we not unfrequently find spots of extravasation, the submucous tissue being injected with blood, which either has escaped from the rupture of a minute capillary, or transuded through the parietes of the vessels. In those membranes which present numerous villi on their surfaces, inflammation begins by red points or dots, which appear to occupy the extremities of the villi, giving them a tumid erectile appearance. This condition of the membrane may be clearly demonstrated by examining it under water, or with the aid of a lens, or even by viewing its surface in an oblique direction. As the inflammation advances, the number of points increase, appear to coalesce, and give an aspect of diffused redness to the surface of the membrane. When the colour of the mucous tissue is naturally red, the increased colour is uniform, nor is there an obvious appearance of arborescent or capilliform injection.

The surface of inflamed mucous membrane loses much of its natural softness; it is rugous, and if it be covered with papillæ, these bodies are rendered more prominent and swollen than natural; if with villi, a similar effect is produced; if crypts abound on the surface, the orifices of these secretory organs are less apparent, from the swollen condition of their margins.

Increase of the thickness of the membrane is a constant attendant on inflammation, as is well seen in coryza and laryngeal inflammation; it is in general immediately consequent on the redness, and in proportion to the degree of vascularity. At an early period of the attack, the density of the membrane appears to be also increased, but as the inflammation advances, the membrane becomes softened. The condition of the submucous tissue is deserving of attention; it is frequently infiltrated with a serous, or occasionally a bloody fluid, by which the thickness of the membrane is increased: this is more conspicuous when there are folds, such as the valvulæ conniventes.

A particular affection to which some mucous membranes are more especially liable may be here alluded to; it is, as Gendrin has well observed, intermediate between inflammation and œdema, and is distinguished by the term œdematous, on account of its principal characteristic being extreme infiltration of the substance of the mucous membrane, as well as of its submucous tissue, with serum. Of this, œdema of the glottis, and the œdematous condition so often seen in the velum and uvula, present familiar examples. The adhesion of the mucous membrane to the surfaces which they line is diminished considerably by inflammation, so that they are detached from them with facility — a facility, however, which varies according to the natural thickness of the membrane, and the structure of the connecting cellular tissue.

At the first invasion of the inflammation, the secretion of the membrane is somewhat increased in quantity and less viscid than natural; when the inflammation is at its height, the secretion is almost suppressed, and the membrane consequently dry; but as this period is always of short duration, the secretion is soon re-established, and often discharged in considerable quantity, assuming at times a greenish colour, and being occasionally tinged with blood. The orifices of the follicles are generally enlarged and open. Towards its decline, the secretion sometimes assumes a puriform character, and is in general very copious; this has been long known in the schools as exemplifying purulent secretion without solution of continuity.

Acute inflammation of mucous membrane sometimes terminates rapidly in gangrene, giving rise to the formation of large sloughs, which, when thrown off, leaves a considerable solution of continuity. Such is the case in certain inflammations of the throat, (*cynanche maligna,*) and in some severe forms of dysentery; in which disease the mucous coat of the large intestine often presents several patches of this kind.

The action of some acrid poisons excites in mucous membrane a high degree of inflammatory action, of which, universal tumefaction of the membrane, and sometimes black or livid spots, produced by the infiltration of the subjacent tissue with dark blood, are the unequivocal signs.

Such are the appearances which characterize erythemoid inflammation of mucous membranes: all are of great value, in deciding the question as to the existence of inflammatory action, a point in the determination of which great caution should ever be observed.

The anatomical characters of chronic inflammation of mucous membranes differ in some essential particulars from the acute, the appearances varying according to the stage and duration of the inflammation. It occurs in patches or stripes, the intervening portion of the membrane preserving its natural pale colour. In the more recent cases, the colour is of a dusky red, inclining to a mahogany tint: the substance of the membrane is thickened and increased in density, the mucous follicles are slightly enlarged, and the secretions are copious, viscid, ropy, or puriform, as in chronic ophthalmia, bronchitis, gonorrhœa, or catarrh of the bladder. When the inflammation has been of longer duration, the dusky redness of the former stage passes into an ash-grey colour, interspersed with black spots or streaks, which gives the membrane a dark mottled appearance. The thickening also not only disappears, but the membrane becomes even thinner than natural, and sometimes considerably softened; this softness, when combined with serous infiltration of the submucous cellular tissue, is the cause of the mucous being so easily detached from the muscular coat, and gives the internal surface of the membrane an œdematous appearance. In cases of inflammation of the mucous membrane of long standing, this tissue is sometimes still more altered in structure; it becomes hypertrophied and indurated; its colour changes to a grey white; its surface appears rugous and granular; and, finally, effusion of an albuminous matter, between all the coats of the intestine at the points of disease, obliterates the structure so entirely, as scarcely to leave any traces of its original configuration. Vegetations resembling warts are also in those latter instances not unfrequently found on the mucous surface. These appearances, which affect exclusively villous membranes, may be often observed in cases of chronic dysentery.

2. *Pseudo-membranous Inflammation.* — Mucous as well as villous membranes, when acutely inflamed, effuse a concrete fluid, which, neither in appearance nor in chemical properties, can be distinguished from that which is formed by serous membranes.

It has been affirmed by Bichat and others that mucous membranes do not effuse lymph or contract adhesions. On this subject Dr. Craigie observes that the question of adhesion depends not so much upon the fact of albuminous exudation as upon the anatomical disposition of the cavity or canal, whether it be sufficiently small to favour the approximation of opposite and corresponding surfaces. Thus in the gastro-intestinal mucous membrane, which is in general capacious and distended either incessantly or frequently with foreign bodies, mutual approximation is too imperfect to admit of adhesion. Yet by some observers this is asserted to have happened. In situations, on the contrary, in which mucous surfaces line narrow tubes, as the lachrymal duct, the Eustachian tube, the urethra, and perhaps the Fallopian tubes, obliteration of the canal by adhesion of its sides is more frequent.

It is certain that the surgeon has not unfrequently occasion to observe corresponding points of narrow canal, as the urethra, adhering apparently by concretion of its sides. Dr. Craigie concludes from these facts that the assertion of Bichat, of the inaptitude of mucous surfaces to adhere, requires some limitation; and from other facts, he is disposed to infer that one of the conditions necessary to the albuminous exudation and the subsequent concretion of mutual surfaces, consists in the destruction of the mucous epidermis by abrasion or ulceration.

These false membranes adhere in some instances to the mucous surface by which they are effused, and often form an exact mould of the cavity or canal in which they occur: they are of a much softer texture than the false membranes which exude on inflamed serous surfaces, and have no trace of organization. When this membraniform exudation succeeds to acute inflammation of the mucous membrane of the mouth and pharynx, it constitutes that disease which Bretoneau describes under the name *Diphtheritis*, which first appears in the form of small points or streaks of redness of the mucous membrane, but without much swelling; this is succeeded by the exudation of isolated white spots, chiefly on the follicles at first, which gradually increase in number, and cohere in patches, occupying a more or less considerable portion of the surface of the uvula, tonsils, and posterior pharynx. These membranous formations, when detached, vary in thickness, but are generally white and transparent; when they are of an ash-grey colour, this arises from their being tinged with blood. This colour, and their being often accompanied with fetor, render them liable to be mistaken for gangrenous sloughing of the mucous membrane of the throat. They may be confined to the mouth and pharynx, or they may extend and dip into the larynx, œsophagus, nasal fossæ, or Eustachian tube, and when they are thrown off, are in some cases renewed several times. Andral met with a case of inflammation of the pharynx with membranous exudation on the palate and tonsils. The inflammation spread to the larynx, and destroyed the individual. On opening the body, false membranes were found not only in the larynx, trachea, and bronchial tubes, but on the inner surface of the nostrils and around the ethmoid cells. The inflammation in this case had thus spread from the pharynx to the vocal and respiratory organs, and into the cavity of the nose. (Arch. Med. 1825.)

The air-passages are more frequently covered with false membranes than any other mucous surface; and it may be observed that children are more subject to affections of the mucous membrane of the air-passages—the formation of false membranes is consequently more common at this than at other periods of life. When they form in the air-passages, they vary in thickness and consistence; some are transparent, and of extreme delicacy; others are several lines in thickness, and so consistent, that they can not only be removed entire, but afterwards preserve their moulded form. A viscid fluid is interposed between the inflamed surface and the false membrane, by which their adhesion is prevented: in some instances minute filaments have been observed in these exudations, by which it has become united to the surface on which it has formed.

We have already mentioned that the membrane which is formed in diphtheritis sometimes dips into the upper part of the larynx. Inflammation of the mucous membrane of the larynx is, however, seldom followed by membranous exudation, but generally, when intense, the inflamed membrane is covered with thick viscid or semi-puriform fluid, which is most abundant in the sacculi of the larynx. Minute portions of fibrine may be occasionally effused, and give a greater degree of consistence to the exudation. The pathology of these cases is, however, very different from that of laryngitis, in which the inflammation is seated in the submucous cellular tissue by which the mucous membrane is united to the cartilages of the larynx.

In tracheitis, or croup, the inflammation is followed by the rapid exudation of a tenacious membranous substance, which is moulded to the form of the trachea. This false membrane is generally limited to the trachea and of a tough consistence; when it extends to the bronchia it is much softer, and in the smaller bronchial tubes it becomes quite fluid. The impediment to the respiration in croup is to be attributed in a great measure to the presence of these false membranes, but also to the swelling of the tracheal membrane, and to the bronchitis which very often accompanies the disease. The spasmodic affection of the muscles of the larynx, which occasionally accompanies croup, adds much to the sufferings and danger of the patient: when the disease proves fatal, the death is owing to the mechanical obstruction of the air in the trachea and bronchial tubes by the false membranes.

The formation of false membranes is also a consequence of inflammation of the gastro-intestinal mucous membrane; and, as noticed by Andral, it occurs more frequently in its supra-diaphragmatic than its infra-diaphragmatic portion. In children, the mouth, pharynx, and œsophagus are occasionally lined with a membraniform exudation, which terminates abruptly before it reaches the stomach. After puberty, these formations are equally uncommon, either on the internal surface of the stomach or intestines, Andral having never seen any either in the stomach or small intestines, and in only two instances had he observed false membrane lining the large intestine. Cases, however, of this kind have been observed in adults. We lately attended a female who frequently voided a considerable quantity of false membranes from the bowels. They appeared, from their size and form, to have been effused on the mucous surface of the small intestines, and evidently, from the history of symptoms, were the result of chronic gastro-enteritis. The disease disappeared after repeated local detractions of blood from the surface of the abdomen, counter-irritation, and a bland diet.

Andral mentions a remarkable case of a young girl of twelve years of age, in whom all the air-passages were lined with false membranes; they were found also in the pharynx, œsophagus, and stomach, where they existed in the form of large bands, extending from the cardiac to the pyloric orifice, beyond which point they did not reach. The mucous membrane was much more red beneath than in their intervals.

Pathological writers allude to the discharge of portions of the mucous coat of the bladder. There can be little question, we presume, that these morbid products are false membranes which have formed on the internal membrane of the bladder, and after being detached, have been expelled with the urine. The urethral mucous membrane appears to assume the puriform secretion rather than exudation of lymph. The inflammation frequently extends to the submucous cellular tissue, and by infiltration and thickening of this structure, contraction or stricture is induced.

False membranes occasionally form in the cavity of the uterus, in consequence of an irritated or inflamed state of the uterine mucous membrane. These membranes are sometimes thrown off in detached shreds after painful menstruation, or at irregular periods, when the internal surface of the uterus is inflamed. In some instances they bear the exact mould of the cavity of the uterus, and have such a degree of consistence as to admit of manual examination and even preservation in alcohol. Sterility is a common effect of these false membranes of the uterus.

3. *Pustular Inflammation* has its seat chiefly, if not entirely, in the mucous crypts or follicles. We not unfrequently meet with a simple enlargement of these glandular organs (glandular so far as they are connected with a secreting function), in certain forms of fever, as well as in other anomalous affections. When acute inflammation attacks one of these follicles, it becomes enlarged, swollen, and vascular. The mucous membrane and subjacent tissue soon exhibit marks of the inflammatory action; and when the membrane is villous, the villi are red and increased in size. A pustule is formed, round and prominent, more or less acuminated; and if a set of aggregated follicles become inflamed, the pustule is more flattened, and has a larger circumference. Frequently we find on the apex of these bodies a minute orifice, indicated by a dark spot, through which by pressure we soon squeeze out a mucous or puriform fluid, whilst in others we cannot observe any trace of an orifice.

The pustules of mucous membranes which we have most frequently an opportunity of examining, are those more especially seen in the membrane of the mouth and pharynx. They are usually known under the name of aphthæ, and are essentially the same in their mode of origin, as those which are developed on the deeper-seated membranes.

The pustules on the inner surface of the intestinal tube often appear in a form nearly resembling that of the variolous pustule. The occurrence of these intestinal pustules in connection with fever has been minutely noticed by Rœderer and Wagler in their history of the Gottingen epidemic, and afterwards by Petit, Pinel, and others. They have been supposed to coexist frequently with the cutaneous eruption of small-pox; and we may add, that although this is not a very frequent occurrence, yet a sufficient number of cases are on record to establish the fact.

We may, however, state that the possibility of the existence of pustules on a membrane devoid of an epithelion has been called in question. But if it be considered how numerous are the mucous crypts, and that in general, if not always, the pustule (so called) is found to occupy one or more of these, we can have no difficulty in accounting for its formation. In some instances, the apex of the pustule presenting a minute opening, in others that opening being closed by adventitious membrane, the follicular pustules of mucous membranes may be said to correspond in every respect with the pustules of the follicles and sebaceous glands of the skin, as exemplified in acne, mentagra, porrigo, and some varieties of impetigo. The analogy between the pustules that occur on membranes provided with epithelion and those of the skin is sufficiently obvious.

It may be mentioned that the most constant and frequent locality of pustular inflammation in the intestinal canal is about the cœcal half of the ileum. This is the form of disease described by Bretonneau under the appellation *Dothinenteria.* (See Fever.)

4. *Ulcerative Inflammation.* After a pustule is fully formed, its centre soon becomes depressed, and it loses its conical form. In some cases, this depression is owing to an enlargement of the orifice of the follicle, but more frequently it is produced by an incipient ulcer. The increase of this depression, and the gradual disappearance of the pustule, indicate the progress of the ulcerative process; finally, a circular ulcer, or when several follicular ulcers cohere, a patch of ulceration occupies the site of the original pustule. This is the most frequent commencement of ulcers of mucous membranes: their numerous variations of form, extent, and depth, are dependent on the intensity of the inflammation, and the extent to which the neighbouring tissues are involved. Ulceration of a mucous surface does not always originate in the follicles: it is sometimes the result of acute inflammation of both mucous and villous tissue; or of small sloughs, or even of an inflamed or diseased condition of a subjacent tissue; as, for instance, when a tubercular deposit in that tissue acts as a source of irritation to the mucous membrane.

Andral reduces the forms of those ulcers which are met with in the intestinal canal, to the following:—1. The circular form, remarkable for their great regularity. 2. The oval form, particularly noticed in the ulcerations of Peyer's glands. 3. The linear form, the ulcer appearing as a groove or fissure. 4. The irregular form, the margin being jagged. This latter form occurs most frequently.

Ulcers of mucous membranes, when considered as to their depth, or as to the nature of their surface, present many varieties, from simple erosion to the complete destruction of the mucous tissue. Thus, in some there is merely so much of the surface of the membrane eroded as to prove the existence of a solution of continuity: if the membrane be covered with epithelion, it is also removed by the ulcerative process: if it be a villous membrane, the villi are likewise destroyed. This form is the result of an inflammation of slight extent. It is more frequent in its occurrence than is generally thought, as from its superficial nature it is very apt to be overlooked. The floor of the ulcer may be formed by the mucous corion as above described; but when the ulceration is deeper, so as to destroy the corion, the submucous tissue is the foundation of the ulcer, which varies in colour, consistence, or thickness. Sometimes the muscular tissue forms the bottom of the ulcer: this state is met with in fever and in some severe forms of dysentery; not only is the superincumbent tissue removed in these cases, but that which passed in between the fibres of the muscles is, as it were, dissected out. The muscular tissue being destroyed, the bottom of the ulcer is formed by the serous coat of the intestine. These cases often terminate in perforation of the intestine, whether by rupture of the delicate serous membrane, or by an extension of the destructive process to it. The probability of the occurrence of perforation depends, not on the extent or long duration of the ulcer, but on the rapidity with which it burrows.

The possibility of the cicatrization of ulcers of mucous membranes has been disputed: recent observations have, however, fully attested the fact of their cicatrizing. The case of the late Professor Beclard, so well known by reason of the celebrity of the distinguished individual who was the subject of it, would alone prove the fact. This able anatomist, at one period of his life, laboured under marked symptoms of gastric inflammation, which yielded to an active treatment and rigid regimen. Some years after, upon the occurrence of his death from a totally different affection, a distinct cicatrix was found in the small curvature of the stomach. Besides this well-authenticated case, the testimony of Troillet, Louis, and other pathologists, leaves no longer any doubt on this subject.

The gastro-intestinal mucous membrane is by far the most frequent seat of ulceration. Next in point of frequency are the bucco-pharyngeal and laryngeal membranes; while the bronchial and urino-genital portions rarely exhibit ulceration.

Nervous Tissue. Acute inflammation of the brain is comparatively rare as an idiopathic disease, but is often the result of external violence, in which case it is generally partial or circumscribed. Examples of general cerebritis are not uncommon as one of the complications of fever; on examination the brain presents general vascularity, but the congestion is greater in the arteries than in the veins; when the blood is accumulated chiefly in the veins and sinuses, it indicates that the lesion partakes more of the character of venous congestion than of inflammation.

On cutting into a portion of inflamed brain, numerous red spots appear, the blood oozing from small vessels, which in the healthy state convey only the colourless part of the blood. The cerebral pulp is at the same time infiltrated with minute effusions, or spots of blood, which give it a striated, or when the spots are numerous, a marbled appearance; and when in still greater numbers, they form small coagula. These bloody effusions, which may occupy a considerable part of one hemisphere, or only a small portion of the brain, extend more or less in breadth, and give rise to the various shades of redness observed in the section of a portion of inflamed brain, the grey or cortical substance assuming, when inflamed, a dark red or brownish colour, and the medullary a light rose tint.

The highest degree of inflammation which is compatible with the organization of the cerebral tissue is never general, but confined to portions of the brain of various extent, around which the tissue presents the characters of inflammation in a more moderate degree. These inflamed portions, which acquire a certain degree of firmness and elasticity, are not exactly circumscribed, but are continued and blended with the surrounding tissue, the traces of inflammation being gradually lost in the healthy structure. In subacute or chronic inflammation of the brain, the anatomical appearances are much the same as in the acute, but its duration gives rise to important modifications. The redness soon changes to a crimson, purple, or light brown tint; this change of colour is followed by a diminution in the consistence of the inflamed structure, varying according to the duration of the inflammation, from slight though evident softness of the cerebral tissue to pulpiness, or even semi-fluidity. At the utmost limits of moderate inflammation, a slight though evident softness (*ramollisement*) may be remarked, and only recognised by comparing the softened with the healthy portions of the brain. This incipient stage of softening, which we have repeatedly observed in continued fever, is ascribed by some writers to the infiltration of the inflamed tissue with serous fluid, a supposition rendered extremely probable from the circumstance of the portion of the pia mater which invests the softened pulp being at the same time infiltrated with serum. When the inflammatory action has been still more intense, the structure of the brain is not only softened, but disorganized and infiltrated either with blood or pus. When blood is diffused in the disorganized pulp, it constitutes the *red* softening, in contradistinction to that form in which globules of pus are mixed with the broken-down cerebral mass, which, from the colour it acquires, is termed *yellow* softening of the brain.

The red and yellow softening are sometimes combined in the same morbid mass; blood, pus, and brain being thus blended together, and giving the cerebral tissue a dirty grey appearance, the shade varying according to the proportion in which they are mixed.

There is another kind of softening which, though analogous, differs in many respects from either of the preceding—the *white* softening, in which the cerebral pulp is disorganized and infiltrated with serous fluid. It occurs chiefly in isolated parts of the medullary substance, very often in the corpus callosum, fornix, and septum lucidum. The diseased portions are usually of a pure white colour; but when the cortical substance is affected, it inclines more to a yellow or grey tint. This form of softening is often observed in elderly subjects, and is generally accompanied with serous effusion in other parts of the brain: it is also believed by some pathologists to form one variety of hydrocephalic disease.

Softening of the brain occurs more frequently in the cineritious than in the medullary part, the cineritious substance being from its great vascularity predisposed to inflammation: of the central parts of the brain, it is found more frequently in the septum lucidum, corpora striata, optic thalami, central part of the hemispheres, cerebellum and crura cerebri, and, according to Dr. Craigie, in the order now enumerated.

There is another alteration of the brain consequent on inflammation—infiltration of the cerebral tissues with pus, which is in some instances diffused in drops through its substance; in others the purulent fluid is confined in distinct cavities of various sizes, the boundary being formed either by the substance of the brain itself, (*undefined cerebral abscess*,) or by an organized cyst (*encysted cerebral abscess*).

Though suppuration may take place in any part of the brain, purulent collections are more frequently met with in the hemispheres. They are occasionally the result of acute, but more generally of chronic cerebral inflammation; their progress is slow, and the symptoms, which are always very obscure, vary according to their extent and situation.

Abscesses have been found in the cerebellum by various pathologists, the pus being generally confined in an organized cyst.

Induration has been mentioned as an effect of cerebritis, though some authors deny that it is the result of inflammation or of capillary injection. The fact, however, of its being accompanied with injection of the capillaries, and that the symptoms during life were those observed in chronic inflammation of the brain, are strong presumptive evidence of its inflammatory origin. The induration, which may be general or circumscribed, varies from the consistence of wax to that of cartilage.

Ulceration has been stated to be one of the terminations of inflammation of the brain, and without asserting that this lesion never occurs in the brain, we are inclined to think that some of the older authors have described *softening* as ulceration of this organ. In the cases which bear the greatest analogy to erosion, the ulcerative process appears to have commenced at the convolutions, and to have been connected with circumscribed inflammation of the pia mater.

Gangrene of the brain is very uncommon. It is described by Baillie (Morbid Anatomy), who states that portions of the brain occasionally become gangrenous after violent injuries of the head, but that it is extremely rare when the inflammation arises from any other cause. He mentions one case which had fallen under his observation, in which the mortified part of the brain was of a very dark brown colour, and as soft as the most rotten pear. A similar case, succeeding to injury of the head, is given by Saure, (Mem. de l'Acad. de Chir. tome i.), in which the substance of the brain was black and gangrenous to the depth of three fingers' breadth.

The spinal marrow being similar in structure to the brain, is consequently liable to the same morbid changes; our knowledge of its lesions, however, is more incomplete, less attention having hitherto been paid to their investigation. The various morbid changes which have been described by pathologists originate in inflammation either of the membrane or substance of the cord; indeed, though the spinal marrow is enveloped with the same coverings as the brain, inflammation is seldom confined to either the membranes or the substance of the cord, but appears to affect both the one and the other at the same time. Those cases, which have been detailed as examples of meningitis of the cord by Abercrombie and other writers, confirm this observation.

In inflammation of the spinal marrow, the membranes and substance of the cord are much injected. The inflammatory action is soon followed by softening of the spinal marrow for a greater or less extent; sometimes the softening is limited to a very small portion: in other cases it extends throughout the greater part of the cord. Blood is sometimes mixed with these softened portions, constituting red softening; and when pus is intermixed, it gives rise to yellow softening. In some instances, the spinal canal contains a quantity of serous fluid, or a layer of puriform fluid is occasionally spread on the membranes, the pus being occasionally mixed with blood, but without apparent softening of the cord. These cases constitute undefined suppuration or abscess of the cord.

The tissue of nervous cords and their minute filaments becomes occasionally inflamed, and gives rise to a variety of acutely painful sensations. This affection may have a spontaneous origin, but it is more frequently produced by punctured, lacerated, or contused wounds, or by the application of a ligature, as in the common accident of including a nervous twig in tying a blood-vessel for the suppression of hemorrhage or the cure of aneurism. In these cases it is supposed that inflammation is produced in the neurilema or covering of the nerve, which becomes vascular, indurated, and painful. We have an example of spontaneous neuralgia or nerve-ach in sciatica, in tic douloureux, and neuralgia of the median nerve in the arm, and posterior tibial nerve in the leg. These neuralgic affections may also arise from external violence applied in the vicinity of their origin, and of those parts in which they ramify.

Inflammation of nervous tissue may terminate in resolution, in effusion of lymph around the nerve, in ulceration, and in enlargement of the nerve from deposition of new matter. This latter state sometimes succeeds to amputation; the extremities of the nerves become inflamed, and finally much enlarged and indurated — the consequences of chronic inflammation of their neurilema.

Vascular System. Notwithstanding the important share the blood-vessels have in the pathology of inflammation, they are not themselves very often the subject of this action. There is still much difference of opinion among pathologists as to the precise anatomical appearances which should be considered as indicating inflammation of blood-vessels, some attaching no importance to changes in colour and consistence, which others deem important lesions and the cause of many serious diseases.

The following are, however, the characters of acute inflammation of a large blood-vessel: redness, rugosity, thickening and softening of its internal membrane, the coagulated blood adhering to it either immediately, or through the intervention of a layer of effused lymph: the middle and outer coats are also injected, thickened, and lacerable, and the consistence of the vessel is so much diminished that it is very easily torn.

1. *Inflammation of Arteries.* Though arteritis was considered by Laennec a very rare disease, subsequent investigations have proved that it is not altogether so uncommon as this celebrated pathologist was inclined to believe. The larger arterial trunks have been found more frequently inflamed than the smaller branches; indeed, from the silence of authors on the subject of inflammation in the smaller arteries, it may be concluded that it very seldom occurs.

Arteritis may be either acute or chronic. In acute arteritis the internal membrane is of a bright red colour, and evidently swollen. It is sometimes difficult to determine, whether the redness in the internal membrane of the heart and the larger arteries arises from inflammation, or is the effect of imbibition or staining. When the redness is not accompanied with vascular injection, tumefaction, and alteration of tissue, more particularly when it is circumscribed and terminates abruptly, or appears in patches, it is to be ascribed to imbibition from contact with the blood contained in the artery. When the redness arises from inflammation, the membrane loses its polished and glistening appearance, has a villous aspect, and is easily detached from the other coats. The vasa vasorum also become more numerous and injected, and although it is often difficult to recognise these vessels in the centre of an inflamed membrane, they become clearly developed at its limits. The redness of inflammation differs also from that of imbibition in presenting various tints in the different coats, whereas inflammatory redness preserves the same colour in all. It is, therefore, now agreed that redness of the internal membrane of the heart and arteries, unaccompanied by any other anatomical characters of inflammation, cannot be deemed evidence of arteritis. In inflammation of arteries the redness is accompanied with thickening and swelling of the inner membrane, effusion of lymph either on its free or adherent surface, and increased vascularity with softening of the middle coat, so that the internal and middle tunics present all the ordinary characters of adhesive inflammation. In genuine arteritis, too, the coats are easily detached from each other, and some writers have observed, in intense cases of arterial inflammation, purulent effusion or infiltration between the coats, but more frequently purulent exhalation from the surface of the internal membrane.

Chronic arteritis is also chiefly confined to the larger arteries, being seldom if ever met with in the smaller arterial tubes. The chief feature of chronic inflammation of the inner membrane of the heart and arteries is redness, but even in recent cases it is more deep than in acute arteritis. When the disease is of long standing, the membrane becomes of a dusky red or brown shade, rugous, and generally softened. These appearances are more remarkable in the vicinity of calcareous, bony, and other morbid deposits, from which circumstance many pathologists have concluded that chronic inflammation is the original source of these organic lesions in arteries. Without attempting to deny the possibility of this origin of these deposits in inflammation, we may remark that their primary formation is not in the inner membrane, but either in the middle coat or in the delicate cellular tissue, which connects the middle to the inner tunic, and that this coat can often be detached from these deposits. Besides, in endeavouring to come to a correct conclusion on this subject, it is to be kept in mind that these various morbid alterations in the arterial coats, whether steatomatous, cartilaginous, calcareous, or bony, form in detached points remote from each other, and without any appearances which indicate the previous existence of inflammatory action. Laennec states that though we know not the nature of the derangement of the economy that produces an ossification or a cancer, it is certainly not the same as that which produces pus. Other writers have endeavoured to clear up the difficulty by supposing that all these morbid changes, which are not the usual products of common inflammation, are the effect of *specific* inflammation; the calcareous deposits, for example, requiring the gouty diathesis for their elaboration; so that, according to this view, every variety of disposition must be the result of a different specific inflammatory action. (See Arteritis.) In whatever way these morbid productions are originally formed, the irritation they induce in the arterial coats is evidently a source of chronic arteritis, which may terminate in ulceration.

2. *Inflammation of Veins.* This is a more frequent and fatal disease than that of arteries. Though frequent allusions were made to this lesion, the first distinct account was given by the late John Hunter, in a paper in the Transactions of a Society for the Improvement of Medical and Chirurgical Knowledge, in which many of the most important facts connected with inflammation of veins are clearly pointed out. Since the time of Hunter, many valuable contributions have been made to this department of pathology by Meckel, Breschet, Bouillaud, Velpeau, Dance, Ribes, Hodgson, Davis, Travers, Arnot, and Lee.

The anatomical characters of an inflamed vein are, uniform redness, more or less deep, with swelling and pulpiness of the inner coat, which is easily detached from the middle tunic. The redness and swelling soon extend to the middle and outer coats, so that the vein feels hard and contracted, resembling a deep red cord, imbedded in its cellular sheath, which is generally infiltrated with bloody serum.

The canal of the inflamed vein is filled with coagula of blood often mixed with pus, or a false membrane adheres to the inner membrane, filling its cavity completely, and rendering the vessel an impervious cord.

When a vein becomes inflamed after a wound or puncture, the inflammation sometimes extends along its inner or lining membrane to the principal venous trunks, and occasionally to the membrane which lines the cavities of the heart. From the facts adduced by Mr. Arnot, it appears that there are considerable differences in the extent of vein occupied by inflammation in phlebitis. In some instances the inflammation is limited to the vessel in which it originally appeared; in others it is found to have spread into several or most of the veins of a limb, from that primarily affected. These circumstances, as well as the fact that death has resulted from phlebitis limited to a few inches only, lead to the conclusion that the danger from this disease bears no ratio to the extent of the inflammation of the vein.

The anatomical appearances of an inflamed vein are uniform deep redness of the inner membrane extending over a limited or more extended portion of the vessel. The coats of the vein are generally swollen and indurated, and more easily separated than in the healthy state. The dense cellular substance in which the vessel is imbedded, is at the same time injected and infiltrated with bloody serum. The cavity of the vein is filled with coagula, with which purulent matter is occasionally blended, and its diameter contracted or often obliterated by false membranes which adhere to the surface of the inner coat, and thus render the vessel a hard impervious cord. In fourteen cases out of nineteen, Mr. Arnot found pus, or pus mixed with lymph, in the cavity of the vein; in two the contents are described as consisting of "adhesive matter," and in another the vena cava contained "flakes of lymph." In one case, described by Mr. Hodgson, in which the inflammation occurred in a vein previously diseased, neither pus nor lymph was found in the vessel.

The characters of chronic inflammation of veins differ little from the acute. The redness is of a more deep brown or violet tint, and the coats more thick, so that when the vein is cut across, it preserves its cylindrical form like an artery. The contents of the vein are similar to those described in acute inflammation.

Ulceration occurs more frequently in the larger arterial trunks than in the veins. We have already noticed ulceration of the internal membrane of the heart as an occasional consequence of inflammation. In arteries, the ulceration may be confined to the internal tunic alone, or it may extend to and destroy the muscular coat, so that the blood escapes through the erosion, and, distending the external coat, gives rise to the aneurismal dilatation so minutely described by Scarpa, and which indeed, in the opinion of this pathologist, constitutes the true anatomical character of aneurism. In process of time, however, or from violence, the external coat may be lacerated; the blood then escapes into the cellular sheath in which the artery is enveloped, and thus a true aneurismal tumour is formed.

When ulceration of the larger veins has been observed, it has apparently commenced in the internal lining membrane, and gradually extending to the other coats. The vein has sometimes formed an attachment to some adjoining hollow viscus, the tissue of which becomes also destroyed by ulcerative absorption, and the blood thus escapes into its cavity.

Blood-vessels may be said to be insusceptible of gangrenous inflammation, as they escape the general destruction of the tissues in mortification and sphacelus. It is extremely doubtful if the tissue of the heart be ever affected with gangrene, the cases mentioned by Senac, Portal, and Corvisart, in which gangrenous spots were seen on the surface of the heart, being too vaguely described to be admitted as examples of this lesion.

The tissue of arteries seems to have great power in resisting mortification. Dr. Thomson relates that he has seen instances of phlegmonous erysipelas, in which several inches of the femoral artery were laid completely bare by the gangrene, ulceration, and sphacelus of the parts covering it, without its giving way before death. The arteries had the appearance of raw flesh, and were obviously thicker and more vascular than natural, the blood circulating through them, and assisting in supplying with nourishment the parts on which they were distributed. When gangrenous inflammation has been so severe that it extends to the blood-vessels, it has been observed that hemorrhage does not take place, either when the vessel is divided, as in amputation of the limb, or when the limb has dropped off. The blood is prevented from escaping in those cases partly by the extension of adhesive inflammation, which occurs in the line of separation between the dead and the living parts, to the blood-vessels of the limbs, so that their surfaces are pressed together, and adhere more or less completely, and partly also by the coagulation of blood in the extremity of the vessels. This filling up of an artery by coagulated blood happens, Dr. Thomson conceives, by the closure, by adhesive inflammation, of the small branches going off from the trunk, and by the disposition which is given to the blood to coagulate, in consequence of the secretion of coagulable lymph on the inner surface of the inflamed vessel.

Inflammation of the Lymphatic Vessels.—This system of vessels is not unfrequently inflamed; and, according to Bichat, inflammation occurs more frequently in the absorbents than in the veins. This assertion is corroborated, when we reflect that the absorbents are constantly exposed to irritation from wounds, punctures, and the introduction of morbid poisons into the system through the external surfaces. Though inflammation of the absorbents is by no means a rare disease, it seldom proves fatal, the inflammation generally terminating in resolution. In those cases in which an opportunity has been afforded of examining an inflamed absorbent, its coats have been found swollen and indurated, and a layer of plastic lymph adhering to its inner membrane. The cellular tissue surrounding the inflamed vessel is involved in the inflammatory action, denoted during life by a red line, which is exquisitely painful, and after death by induration and serous infiltration.

Andral has examined the thoracic duct and lymphatic vessels in upwards of six hundred subjects, and found but in a very few instances any appreciable alteration of the thoracic duct. In three cases only its parietes appeared red and injected; and in one of these the interior of the duct was filled with pus, and its coats were thickened and friable. In the case of a woman, who died at La Charité, with cancer of the uterus, the thoracic duct, which was considerably enlarged, and of a dead white colour, was filled with a puriform fluid, and its internal surface studded with an infinite number of round white bodies about the size of peas; in the intervals between which the parietes of the duct were thickened, and of a dead white colour, traversed here and there by reddish lines, and in other points they were reduced to a soft pulp of a dirty reddish white. The left subclavian vein, into which the duct opened freely, was distended by a number of dense firm clots of blood firmly adhering to the coats of the vein, the inner surface of which was wrinkled, and of a deep brown colour. This affection of the thoracic duct and subclavian vein evidently originated in inflammation. Andral has occasionally met with the same morbid changes in the lymphatic vessels.

Inflammation of the lymphatic ganglions is more common than that of the lymphatic vessels. Those ganglions are composed of two distinct tissues,—lymphatic vessels variously convoluted, and cellular tissue, by which these convolutions or ganglions are united. These distinct structures may be demonstrated in the human subject by anatomical injection and nice dissection, and the various diseases to which these ganglions are liable originate in one or other of those two anatomical elements. Inflammation of the lymphatic ganglions, which may be propagated from the lymphatic vessels, or arise primarily in the ganglions, is characterized by redness and swelling. The inflammation may be confined to one ganglion, or it may extend to several. The enlargement apparently arises from tumefaction of the cellular tissue, which unites the convolutions of the lymphatics, or from thickening of their coats, as a mercurial injection passes freely through all the convolutions of an inflamed lymphatic ganglion, proving that their cavity is still pervious.

When an inflamed ganglion is cut into, a number of small brownish red points are seen on the divided surfaces; these are exudations from the divided blood-vessels, which have become diffused in the red substance of the inflamed ganglion. When the inflammation is more intense, the consistence of the ganglion becomes of a dark violet colour, spongy and soft, and often mixed with blood.

When the inflammation terminates in suppuration, the pus may be infiltrated in cellular tissue connecting the convolutions, or in the structure of the ganglion, giving it a dirty grey or ash colour. In other cases an abscess forms, so that all traces of its parenchymatous structure are lost, the cellular envelope of the ganglion alone remaining and forming a cyst to the abscess.

When lymphatic ganglions are affected with chronic inflammation, the swelling and hardness are greater than when the inflammation is more acute. The cellular tissue, in which they are enveloped, becomes also inflamed, and forms a dense capsule around the ganglion. Lymphatic ganglions may enlarge in groups, as when the mesenteric glands become enlarged from follicular ulceration, or in chronic non-suppurating buboes of the axilla or groin. When an incision is made into a ganglion affected with chronic inflammation, it presents a dense homogeneous structure of a brown red colour, the vessels with which it is traversed being increased in number, tortuous and dilated, ramifying in all directions, and interspersed with white cellular filaments.

Chronic inflammation of lymphatic ganglions seldom terminates in suppuration unless acute inflammation supervene. The pus in these cases is infiltrated in the cellular tissue covering the inflamed ganglion.

Inflammation of Muscular Tissue.—From the comparatively few opportunities of examining inflamed muscular tissue in the human subject, it has been necessary to institute experiments on the lower animals, with the view of ascertaining the appearances this tissue presents when inflamed. The muscular tissue itself does not seem to assume readily inflammatory action; at least inflammation does not leave any well-marked traces of its existence. The principal alteration appears to take place in the intermuscular cellular tissue, which becomes red from increase in the number and size of its blood-vessels; the muscular fibres are at the same time somewhat increased in density, while the contractility, and consequently the power of motion, are more or less impaired, according to the degree and duration of the inflammation.

Gendrin states that if a portion of the centre of a long muscle be once inflamed, its extremities alone retain the contractile power, the middle or inflamed part remaining quite motionless, although the nerve which supplies the muscle is irritated, or even when it is subjected to the influence of galvanism. As the inflammation advances in duration or intensity, the cellular tissue which enters into the composition of the muscle, as well as that which connects it to the surrounding parts, becomes swollen and infiltrated with serosity, with which a portion of coagulable lymph is generally mixed, whereby its density is not only increased, but the muscular tissue so firmly bound and interwoven, that it is difficult to separate the two tissues, and when this is effected by dissection, the muscular tissue appears sensibly swollen, and of a more or less deep red colour. When the inflammation is intense, the cellular as well as the muscular tissue assumes a deep red or violet colour, and traces of commencing disorganization are perceptible, the muscle and its connecting cellular membrane becoming softened and infiltrated with blood. Suppuration finally takes place, the pus being diffused both in the cellular tissue which surrounds, and in that which enters into the composition of the muscle. The muscular substance becomes finally completely disorganized, and often sloughs extensively; or it is converted into a grey indurated mass, in which irregular cavities form, containing a dirty serosity or ill-conditioned pus.

It appears too from repeated experiments, that when the muscular tissue is destroyed, it is never regenerated; the lesion being repaired by the formation of a cellular or fibrous web which fills up the vacant space. There are several instances of chronic suppurative inflammation in muscle on record, the best example of which is inflammation of the psoas muscle, of which Schoenmezel (De musculis psoa et iliaco suppuratis, Heidelbergæ, 1776,) has given a case in which the whole of the *psoas magnus* and *iliacus* of the right side was destroyed and converted into purulent matter, forming a sac which extended from the last lumbar vertebra along the surface of the ileum to the small trochanter.

Inflammation of the muscular tissue of the heart is acknowledged to be a very rare affection, and according to the testimony of Baillie and Laennec, when it does happen, it is never a primary disease, but the consequence of extension or inflammation of the pericardium to the muscular structure of the heart. Though cases of genuine carditis are confessedly rare, the probability of its occurrence is placed beyond doubt by the instances which have been recorded; the most satisfactory we have met with is that related by Mr. Stanley, (Med. Chir. Trans. vol. 7,) in which the inflammation was general throughout the tissue of the heart.

The most unequivocal proof, however, of true carditis is when the inflammation terminates in suppuration. In these cases the inflammation is partial, and confined to those portions of the cardiac tissue in which the pus is deposited. The abscess is uncircumscribed, the purulent matter being infiltrated in the cellular membrane which connects its muscular fibres.

Ulcers of the heart have been found both on its external and internal surface, though this lesion also has been very rarely observed. The only case Laennec ever met with occurred on the internal surface of the left ventricle; it was an inch long, and half an inch wide, and more than four lines deep in the centre. This ventricle, which was at the same time in a state of hypertrophy, ultimately ruptured. The patient survived only two days.

Inflammation of the tongue (*glossitis*) is a very formidable disease, whether we regard its effects on respiration or deglutition. The organ, when inflamed, becomes swollen, of a vivid red colour, and very painful; as the inflammation proceeds, the swelling increases often to such a degree, that the tongue is thrust out of the mouth, and by its pressure on the larynx impedes both respiration and deglutition. The inflammation may terminate in resolution, suppuration, or even gangrene. The first is the more frequent result, which the practice of making deep incisions into the inflamed tongue tends greatly to promote. When suppuration takes place, the abscess is sometimes superficial, so that it points, and may be opened by an incision. In other instances it is deep-seated, and from the increased swelling there is so great hazard of suffocation, that, if deep incisions made into the tongue do not reach the abscess, it may become necessary to open the windpipe to save the patient's life—an operation which has been repeatedly performed with success in such cases. Gangrene is a rare termination of glossitis, and is indicated by the dark livid colour of the tongue, and the gangrenous odour from the mouth. (See GLOSSITIS.)

The uterus being a muscular organ, is liable to the effects of inflammation of this tissue. Uterine inflammation is generally partial, occupying particularly the fundus and posterior part of the organ, and is almost invariably accompanied with inflammation of that portion of the peritoneum which covers its fundus. Its vessels are at the same time gorged with blood; the internal membrane of the organ is of a violet red colour, the injection of the muscular substance giving it a vermilion red or livid hue, according to the duration of the disease; and when blood is extravasated, the portion of the tissue in which this takes place appears marbled, and of a soft spongy consistence. In the more advanced stage of uterine inflammation, pus is infiltrated through its substance, and is generally found at the same time in the uterine veins.

Ulceration is another effect of inflammation of muscular tissue. This is sometimes observed in deep ulcers of the extremities, which corrode in succession the skin, cellular membrane, fascia, and ultimately the muscular tissue. It is also observed in the tongue in idiopathic inflammation of this organ, or when it arises from the use of mercury. We have already seen that ulceration occasionally takes place in the heart, and chronic ulceration of the cervix of the uterus is familiar to every pathologist.

Gangrenous inflammation of muscular tissue occurs in the external muscles, as well as in internal organs which have a muscular formation. This lesion is recognised by the black or green colour of the muscular fibres, which are very soft and easily torn, and by the peculiar gangrenous odour of the sphacelated part. When gangrene occurs in an external muscle, the sphacelated portion may slough off, and the patient ultimately recover. If the sphacelus be extensive, it generally destroys life. Gangrene of an internal organ is almost invariably fatal.

Fibrous Tissue.—Bichat included under this term, *tendon*, *ligament*, *fascia*, *aponeurosis*, and *periosteum*, in which arrangement he has been followed by succeeding anatomists. This general arrangement, however, has been disputed by Dr. Craigie, who regards the anatomical structure of those several tissues, as well as the chemical composition of some of them, so essentially distinct as to preclude this general classification. For example, the structure of tendon differs from that of ligament and periosteum in being united in regular parallel fibres, and having greater tenacity—the fibres in the latter crossing in all directions, and consequently being with difficulty separated. Inflammation of fibrous tissue is attended with the ordinary effects of inflammation, but it rarely if ever terminates in suppuration or ulceration. We shall examine the effects of inflammation in individual fibrous tissues.

In inflammation of tendon, the natural polished glistening appearance is lost, and is succeeded by faint redness; when it is more violent, this injection is accompanied by softness or pulpiness of its texture, and as the inflammation proceeds, the redness gradually passes into a leaden grey colour; the tissue of the tendon becomes subsequently much thickened, and of a doughy consistence, indicating that its vitality is lost. These changes in inflamed tendon are frequently observed in common whitlow, and in severe injuries of the extremities accompanied with laceration, but particularly in gun-shot wounds.

The structure of ligament, periosteum, and fascia, especially that of the two first, is exceedingly similar. The minute filaments of which it consists are so interwoven in various directions, as to form one of the strongest and most compact tissues of the body. It is very sparingly supplied with blood-vessels, nerves, and absorbents. Inflammation of the capsular ligaments of the larger joints, or of the funicular ligaments, as, for example, the lateral ligaments of the elbow, wrist, knee, or ankle-joints, may arise spontaneously, from external injury, or from extension of inflammation of the synovial membrane or articular cartilages to the ligaments. When the inflammation is spontaneous, it is generally of a more chronic kind than when it arises from other causes. Inflammation of ligamentous tissue is speedily followed by thickening of its structure; the inflammatory action is seldom limited, but spreads to the synovial membrane and surrounding cellular tissue, giving rise to effusion into the cavity of the joint, and swelling of its external tissue, which not unfrequently terminates in the formation of superficial abscesses.

Ligamentous inflammation may terminate in resolution or in ulceration, of which latter we have an example in strumous disease of the hip-joint, in which not only a portion of the capsular ligament, but the round ligament which connects the femur to the acetabulum, is destroyed by the ulcerative process.

Inflammation of the periosteum (periostitis) differs little in anatomical characters from that of ligament. It is never confined to this tissue, but extends to the cellular tissue, by which it is connected to the skin and subjacent bone, and from which it is easily separated. A perceptible tumour is thus formed, which is hot and painful, and when examined, is found to consist of injected cellular and periosteal tissue, infiltrated with serum or lymph.

Periosteal inflammation may be limited, or it may spread over a considerable extent. When it is limited to a small spot, it constitutes the swelling termed *node*, which forms more readily in some situations than in others, more particularly on the tibia, radius, ulna, clavicle, and sternum. Nodes are sometimes converted into bony swellings (*exostosis*), the lymph which is effused being mixed with calcareous matter. Periostitis sometimes terminates in suppuration and abscess, in which case the skin and cellular membrane over the diseased periosteum become red, swollen, and very painful; fluctuation is perceptible, and when the abscess is punctured, or bursts spontaneously, the corresponding portion of the bone is generally destroyed by caries. Some cases of periostitis are merely symptomatic of primary inflammation or other disease of the bone, the inflammation having spread from the bone to the periosteum.

Fascia, from its extent and importance in the construction of the body, as well as its being evidently the seat of rheumatism, requires special notice. Dr. Craigie has ably combated the idea that inflammation of the muscular tissue is a cause of rheumatism.

"Independent of the fact that the rheumatic pains occur often round joints in which there are no muscles, the theory is at best only an ingenious assumption, and is not supported by any strong facts or arguments.

"Though rheumatic pain is often referred to muscular parts, it is less frequently so than to joints and parts covered by aponeurotic sheaths and fasciæ. Of 520 cases, Haygarth observed in 388 the rheumatic action to be seated in joints, in 118 in muscular parts, and in 14 wandering, general, or migrating through the limbs. Of 170 cases, in 154 one or more joints were inflamed; in 33 cases both joints and muscles were simultaneously affected; and in some cases only were the muscles affected without the joints.

"Though from these facts Dr. Haygarth infers that acute rheumatism is seated chiefly in the joints, he does not attempt to ascertain the particular texture, in the affection of which the disease consists. It is further manifest that while it is impossible to exclude affection of the muscles entirely, it results that this affection is only secondary. The proof adduced by Dr. Scudamore from pressure of the whole course of a muscle, and grasping its substance during severe rheumatism, to show that the fleshy part is not the seat of complaint, is entitled to attention. Combined with those already mentioned, and with other considerations to be adduced immediately, it results that the rheumatic action is seated in a texture, which, confined neither to the site of the joints nor to that of the muscles exclusively, is common to both, and which, from its extensive distribution and complicated arrangement, accords best with the phenomena, progress, and effects of the disease. It is unnecessary to repeat the considerations above adduced from the anatomical relations and characters of fascia and its various divisions. That they are the chief seat of acute rheumatism, may be inferred from the following circumstances:

"1. When the rheumatic action is seated in muscular parts, instead of being confined to the muscular fibres, it may always be referred to the aponeurotic membrane which covers or penetrates them. 2. The peculiar pains of rheumatism are always most distinct in those situations in which several folds of aponeurotic membranes meet; and their migrations may be traced from one extremity to another of aponeurotic membrane, and along the course of its principal divisions. 3. The kind of pain which attends rheumatism resembles that of the fibrous tissues in general when inflamed, in undergoing aggravation under the influence of external heat, and during the night. 4. This view of the seat of rheumatic disorder affords the most probable explanation of the effusion which takes place in the tendinous sheaths (*bursæ mucosæ*); for since each sheath is partly enveloped in aponeurotic membrane, the inflammatory process which takes place in the latter soon gives rise, as in analogous cases, to effusion, critical or non-critical, from the contiguous synovial membrane. 5. This view also affords the most rational explanation of the fact remarked by all authors, that rheumatism almost never terminates in suppuration. To suppose that muscle does not suppurate is, perhaps, erroneous, from what has been above adduced. That fascia and fibrous tissue in general is little disposed to suppurate, unless when mechanically injured, is manifest from a number of circumstances; and this may, perhaps, be regarded as the true explanation of the fact now noticed. 6. It must further be remarked that inflammation in this tissue renders it thick, hard, and rigid; and occasionally causes between its fibres effusion of lymph, which increases this thickening, induration, and rigidity. On these changes depend the immobility of rheumatic parts, and the loss of power which follows long and obstinate or neglected and repeated attacks of the disease.

"The question whether there be any thing peculiar in the nature of rheumatic inflammation, is not undeserving attention. This, however, is not the place for discussing it; and if the views now advanced be well-founded, it may be inferred that its peculiarities consist in the anatomical and physical qualities of the texture in which I have attempted to show it is seated.

"Though in acute rheumatism the inflammation affects a large proportion, if not the whole, of the fascial system, local forms of the disease may occur, in which it is confined, with more or less accuracy, to one or two fasciæ. Thus inflammation of the fascia of the temporal and masseter muscles produces rheumatism of the temple and rheumatic locked-jaw; that of the occipito-frontal fascia, rheumatism of the head; that of the cervical fascia, crick in the neck; that of the pectoral fascia and the intersections of the intercostal muscles, spurious pleurisy (*pleurodyne*);

that of the abdominal fascia, a rheumatic belly-ach; that of the lumbar fascia, *lumbago*; and that of the aponeurotic parts of the gluteal muscles, genuine *sciatica* or hip-gout. (Op. cit. p. 515.)

Inflammation of cartilage, which is generally of a chronic character, may take place as a primary disease; but it more generally succeeds to synovial inflammation. It is characterized by redness, spongy swelling, softness, and finally ulceration or erosion of its structure. Erosion, which in cartilage is analogous to caries in bone, consists first in minute perforations, which extend in number and depth, and, by their coalescence, form patches of an irregular size and shape. When the erosion extends in depth, the epiphysis of the bone is exposed, excavations form, and sometimes the cartilage is entirely removed. The joint is thus destroyed, unless, as in some cases, *ancylosis* take place.

We have another instance of inflammation and ulceration of cartilage in the larynx, in which the inflammation may either take place primarily, or it may spread from the mucous membrane of the throat to the perichondrium or investing membrane. The disease in these cases is generally chronic, even at its commencement; and, though it may arise from cold, it is more generally to be traced to the effect of a specific poison—the syphilitic or the mercurial. It often succeeds to the development and subsequent disorganization of tubercular formations in the structure of the larynx, giving rise to the disease termed *phthisis laryngea*. Both these differ essentially from the more acute and rapidly fatal forms of laryngitis, which consist in acute inflammation and infiltration of the submucous cellular tissue of the glottis.

Fibro-cartilaginous tissue is regarded as intermediate between the fibrous and cartilaginous, possessing the flexibility and elasticity of the former, with the toughness and resistance of the latter. The intervertebral substance of the vertebræ, the semilunar cartilages of the knee-joints, and the cartilages which unite the pelvic bones, are composed of this tissue. These parts are liable to inflammation, which may either originate in their own substance, but more generally in the surrounding structure, or in the synovial membrane with which they are in most instances invested. The inflammation in fibro-cartilaginous tissue produces swelling and softening, which frequently terminates in erosion, as we occasionally observe after inflammation of the semilunar cartilages of the knee-joint and of intervertebral substance.

Mortification may take place in fibrous tissue. When this occurs, its glistening appearance is lost, and changed to an ash-grey colour, while its texture becomes softened and easily torn. It may even become completely dead or sphacelated, as in sloughing of the cornea, or when large portions of the soft parts, or even an entire limb has been removed by idiopathic gangrene: in these cases the fibrous tissue sloughs with the other structures of the mortified limb.

Bone.—The structure of bone undergoes the process of inflammation, which is the origin of many of those diseases to which the osseous system is liable. It may arise spontaneously, or from various kinds of injuries. The process by which the extremities of fractured bones are united, and the erosion which takes place when the epiphyses become separated, are examples of the adhesive inflammation of bone. The bony union by which these injuries are repaired is effected by the blood which oozes from the periosteal and medullary arteries, and the subsequent elaboration of coagulable lymph into which new vessels penetrate, so that the lymph becomes an organized substance similar to granulation, and is termed *callus*. Upon this new substance points of bone are deposited by a peculiar and hitherto unexplained action of the nutrient vessels; these points of bone become gradually more numerous, and finally coalesce into larger masses, until the fractured extremities are at length united by solid bone.

Idiopathic inflammation of bone may arise either in the periosteal covering, or in the cancelli, or medullary structure. We have already explained the effects of inflammation of the periosteum in producing those swellings called nodes: when the periosteal inflammation is very acute, it produces not only thickening of the membrane and deposition into the subjacent cellular tissue, but inflammation of the portion of bone with which it is in contact. If the inflammation be not promptly arrested, suppurative inflammation of the periosteum, followed by caries or ulceration of the bone, succeeds, which often penetrates the substance of the bone to a considerable depth.

Another form of osseous inflammation is that arising in the filamentous medullary structure of long bones, producing swelling and effusion into the cancelli, which may terminate either in permanent induration and enlargement of the bone, or in suppuration. When suppurative inflammation thus takes place, the matter is sometimes deposited in the cavity of the bone, and generally proves a source of great constitutional disturbance. In other cases the vitality of the bone is gradually destroyed from within outwards, constituting the disease termed *necrosis* by surgical writers. This may affect either a part or the whole of the shaft of the bone; so that the epiphyses and periosteum, which are seldom affected, only remain. In the progress of the disease the dead portions are enclosed in a case of newly-formed bone, and covered with thickened periosteum.

The two diseases termed *caries* and *necrosis* afford an illustration of ulceration and gangrene of bone. In necrosis, however, reparation is effected by the formation of a new envelopment around the mortified or dead bone. In superficial gangrene of the long bones, such reparation is not observed; these latter cases, therefore, have a greater affinity to gangrene of soft parts.

Inflammation of the medullary texture of the epiphyses, and of the short or cuboid bones, such as the vertebral, tarsal, carpal, and digital, is the cause of the disease described by surgical writers under the term *spina ventosa*.

Dr. Craigie states that the cancellated arrangement of the osseous matter and of its medullary web in these bones, explains the progress and phenomena of the disorder. That this is the seat of its action is to be inferred, first, from the phenomena of the disease; and, secondly, from its effects as seen in diseased bones. *Spina ventosa* never occurs in a bone with distinct medullary canal, unless at the epiphyses, where the structure is cancellated. When it takes place in these situations, it first induces an enlargement of the epiphyses, with extreme deep-seated pain in the bone. Soon after the periosteum becomes thick and swelled; and in no long time sanious matter is found beneath it issuing from the cancelli, which are then softened, partially destroyed, and excavated. If in this state such a bone be examined, the broken cancelli are filled with a reddish, soft, spongy, vascular mass, producing flabby granulations *passim*, and secreting bloody sanious fluid. The compact shell is partly destroyed by irregular ulceration, and partly extruded by the distending force of the swelled medullary web. The diseased epiphysis then presents a large irregular anfractious cavern, filled with soft spongy substance, which is either the web itself, or the new products which its inflammation has generated. In this manner it is frequent in the upper end of the tibia or the lower end of the femur, or in the extremities of the radius or ulna. (*Op. cit.*)

The effects of inflammation in the different tissues having been briefly considered, it is necessary to show the changes induced by inflammation in organs which are composed of several tissues (*complex tissues*). The structure of the lungs is, of all the organs in the body, the most complex: it consists of arteries, veins, absorbents, nerves, and the ramifications of the bronchial tubes, lined with mucous membrane, and terminating in very small round cells; all these component parts being firmly united by cellular tissue. It is necessary to be able to distinguish congestion from inflammation of the pulmonary substance, as there is certainly no organ in the body so frequently the seat of congestion. We find very generally, on examining the lungs, even when the person dies in an exhausted state, as in continued fever for example, that the most depending portions are in a state of congestion. This is owing to the blood gravitating from the position of the body after death. This appearance, though often mistaken for the effect of inflammation, is a pseudo-morbid appearance. It is frequently found in cases where there has been a severe and protracted struggle previous to dissolution, or where there has been a mechanical obstruction to the circulation produced by some organic disease of the heart.

The anatomical characters of inflammation of the substance of the lungs (*pneumonia*) differ according to its stage or degree. Laennec has described three stages, which he considers may be easily recognised; these he has distinguished by the terms *obstruction* (*engouement*), *hepatization*, and *purulent infiltration*, all of which present different anatomical characters.

In the first degree (*engouement*, or *obstruction*) the portion of inflamed lung is externally of a livid or violet colour, which is not removed by immersion in water, or even injecting water into the pulmonary vessels, and more heavy and dense than natural. When pressed between the fingers it is still crepitous, though less so than in its sound state, retaining the impression of the finger like an œdematous limb. It is necessary, however, to bear in mind that lungs which possess naturally a considerable degree of density have proportionally less crepitation. This density of the pulmonary tissue is more remarkable in children. When cut into, the structure is of a dark red colour, the tissue being filled with a serous fluid, more or less tinged with blood; but though evidently injected, the natural soft spongy texture is unaltered, and still permeable to air.

In a more advanced stage of pulmonary inflammation, the smaller bronchia, air-cells, and connecting cellular membrane, become swollen, so that the quantity of air in the inflamed portion of lung is diminished and supplied by blood. This constitutes the second degree of pneumonia (*hepatization*). It is characterized by a deep red colour of the inflamed portion of the lung, varying in different points from that of violet grey to blood red, and by the greater density and consistence of the granulated texture exhibited in its section, giving it somewhat the appearance of liver, from which the term hepatization has been derived. The hepatized portion of lung has lost its crepitous feel, is impermeable to the air, and sinks in water; and when divided, no air escapes, but a small quantity of bloody serum, mixed with a thick opaque fluid, may be expressed. When the minute structure is examined closely, the natural pulmonary texture has lost its cellular appearance, and appears to be composed of a number of small red grains, oblong and flattened, which, according to Laennec, are the air-cells transformed into solid grains, by the thickening of their parietes, and the obliteration of their cavities by a concrete fluid. Andral, however, states that this granular appearance is often altogether wanting, so that its surface, when cut into, appears smooth and compact. He supposes the granular appearance to depend on the degree of tumefaction which the air-cells undergo; for when the tumefaction passes a certain limit, its effect is to approximate the cells so closely that they become confounded together, and the granular appearance vanishes entirely.

The extent of pulmonary substance occupied by these two degrees of inflammation is various. Sometimes the inflammation extends over an entire lobe, (*pneumonia lobaris*): in other instances it is confined to one or more lobules (*pneumonia lobularis*): in some cases it affects only the air-cells (*pneumonia vesicularis*): some writers indeed consider that in pneumonia the inflammation commences in the air-cells, from which it is propagated to the parenchymatous tissue.

When pulmonary inflammation has advanced to the formation of pus, this fluid is found either in the form of purulent infiltration, or collected into an abscess. Purulent infiltration is by far the more common appearance; this succeeds to the most intense degree of pulmonary inflammation, and often takes place with great rapidity. According to Andral it has formed within four days after the first symptoms of pneumonia had made their appearance. The portion of lung in which the purulent infiltration has taken place presents an ash-grey colour, from which it has been termed *grey hepatization*, to distinguish it from the second stage of pneumonia, the *red hepatization*. If the pus be squeezed from the pulmonary texture, it assumes the colour of the red hepatization, but it is much softened and consequently easily lacerated. The grey colour is evidently owing to the admixture of pus with the red tissue of the inflamed lung.

These three stages of pulmonary inflammation may be often seen in different portions of the same lung; sometimes an entire lung is infiltrated with pus, while the other presents different stages of pneumonia; some portions being in a state of red, others of grey hepatization, the one stage passing by insensible degrees into the other.

With regard to the portion of lung most frequently affected with pneumonia, it appears from the statements of Laennec, Andral, and others, that it occurs most generally in the lower portions, though it is not uncommon to meet with a circumscribed portion of the centre of the lung inflamed, the surrounding parenchyma being quite sound.

It is a singular circumstance, also, that the left lung should be much more frequently the seat of pneumonia, and, indeed, of almost every lesion, than the right. Of two hundred and four cases of evident pneumonia, the right lung was affected in one hundred and twenty-one instances, the left lung in fifty-eight, and both lungs in twenty-five. (*Andral*, Clin. Méd. tom. ii.)

Abscess of the lung has been very rarely met with, though cases succeeding to pneumonia are recorded by several writers. In these instances the boundary of the excavation in the lung, which is filled with pus, is formed by the pulmonary tissue.

Another and perhaps more frequent form of pulmonary abscess is that in which pus is deposited in the lung, not as the consequence of inflammation, but from this fluid, formed in some other part, being conveyed through the medium of the circulation, and deposited in the lung. There are many striking instances of these purulent deposits succeeding to important operations, and to purulent collections in other organs of the body, which, after an attentive examination, Andral proposes to range in two classes. In one, it appears that the pus is formed in the torrent of the circulation, or is introduced into it from some organ in a state of suppuration, and in its passage through the tissue of the lung is separated as through a filter, and either collected into an abscess, or infiltrates the pulmonary tissue. It is probably by a similar process that mercury injected into the crural vein of a dog traverses the whole circulating system until it arrives at the lung, where it abandons the circulating fluid. In the other class of cases, some cause with which we are unacquainted alters the blood, coagulates it in the pulmonary vessels, and transforms it into purulent matter in the smaller branches of these vessels. (Anat. Patholog. tom. ii.)

The termination of inflammation of the lungs in gangrene is exceedingly rare, and when it is met with, it is not always to be regarded as an indication of the intensity of the pneumonia, as it has been found in cases when the symptoms, as well as the appearances of inflammation, were very slight and equivocal. Laennec regards it as very similar to idiopathic gangrene, such as anthrax, pestilential bubo, and malignant pustule. Andral, on the other hand, asserts that gangrene of the lung, as well as of other parts of the body, may succeed to every species of hyperæmia, whether mechanical or vital, provided it be so considerable as to impede or prevent the afflux of arterial blood to the part.

Gangrene of the lung occurs under two forms —the *circumscribed*, and the *uncircumscribed*; the one differing from the other only in extent.

Circumscribed pulmonary gangrene occurs in a small portion of the lungs only; the mortified part is separated by a suppurative process which is established around it, and the eschar or slough is expelled with the expectoration through perforation of one or more of the bronchial tubes. An ulcerous excavation discharging a dirty fluid remains, which, by mixing with the expectoration, gives it a most offensive odour. When the gangrene occurs near the surface of the lung, it produces erosion of the pleura, which is succeeded by pleurisy and pneumothorax.

Uncircumscribed pulmonary gangrene is much less common than the circumscribed. Laennec had only seen two cases of it during twenty-four years, and he had only known of five or six cases of it in the hospitals at Paris during the same period. He gives the following characters of this lesion, which may occupy a great portion of one lobe, or occasionally the greatest part of one lung. The pulmonary tissue, more humid and less cohesive than in the sound state, has the same degree of density as in the first state of peripneumony, œdema of the lungs, or the serous engorgement occurring after death; its colour varies from a dirty white or slightly greenish hue, to a deep green, approaching to black, with a mixture, occasionally of brown, or of earthy or yellowish brown. In some places the pulmonary substance, altogether or nearly sound, blends insensibly with the gangrenous part; in other instances, these are separated by a portion of lung inflamed in the first degree, and in still rarer instances by pulmonary hepatization.

Spleen.—The spleen consists of few anatomical elements—first, a fibrous investing membrane, constituting its proper capsule of the organ; secondly, an internal cellular arrangement into which the blood is poured; thirdly, blood-vessels, lymphatics, and nerves. As the parenchyma of this organ, therefore, consists of two component ingredients only, fibrous tissue and blood, its diseases must be referable to one or other of these. Andral thinks its diseases ought to be the same as those of the veins, for it is evidently a vast venous network, in which the cellular is substituted for the vascular form. He therefore considers the lesions of the spleen to be of two kinds, those of the first, which are rare and unimportant, have their seat in the capsule, or in its fibrous prolongations, which constitute the walls of the splenic cells: those of the second, of much greater frequency and importance, originate in some of the elements of the blood.

The capsule of the spleen is liable to the diseases of fibrous tissue, and consequently to inflammation, though such instances are rare Abercrombie has seen the spleen completely enveloped in a thick dense covering of false membrane, in connection with peritonitis, but without any disease of its substance. In such cases, however, the lymph was probably effused from the inflamed peritoneum, and not by the capsule of the spleen. This membrane has also been found adherent to the contiguous viscera in cases of purulent infiltration, when the pus is making its way towards the surface of the spleen, and if the organ to which it becomes attached be hollow, (as the stomach or alimentary canal,) the matter is discharged into it. The capsule of the spleen has been found in many of those instances soft, pulpy, and lacerable.

Cases of purulent formations in the spleen are not very common, more especially those in which pus is found in no other organ. It is improbable that such instances originate in inflammation of its parenchyma, since we have seen that its structure is such that it may be said to be almost insusceptible of inflammatory action, unless the blood be presumed to be susceptible of inflammation. Whence, therefore, originates the pus? This is a question of rather difficult solution, though Andral thinks from some experiments it would seem probable that the blood in the spleen may be converted into pus; and that the disturbance in the system which has been observed to accompany this lesion, is to be regarded as the result of the conversion of the blood into purulent matter.

A more frequent form of purulent formation in the spleen is when this organ becomes infiltrated with pus, at the same time that similar purulent deposits take place in other organs. In these cases it is supposed that the pus is formed in some distant organ, and after being carried in the blood, is deposited in the spleen and other organs at the same time. In such examples, the primary disease has sometimes occurred in connection with diseases of the uterus, or of the uterine veins; as in a case recorded in the Transactions of the College of Physicians, (Vol. v. p. 304,) and in another alluded to by Andral, (Anat. Path.): in other instances, the purulent depositions have succeeded to external injuries and severe surgical operations. The pus may be collected in drops, or in cavities of greater or less extent; it is sometimes confined in a cyst of false membrane, but more frequently the wall of the abscess is formed by the structure of the spleen, in which case the abscess is often of very considerable extent.

The termination of such cases is various: the abscess may, by adhesive inflammation and the subsequent process of ulcerative absorption, burst into the cavity of the chest, belly, stomach, or intestines, or it may be discharged through the kidneys by the urine. Splenic abscesses have been known also to open externally through the walls of the abdomen, the back, or the loins. (*Andral.*)

Though the thyroid gland is occasionally inflamed, it seems to be as little susceptible of inflammation as any gland in the body. When inflamed, its vessels are numerous and injected, so that its tissue is red and swollen, and feels much firmer than in its natural state; these changes being produced partly by serous infiltration, or when the inflammation is more intense, by the effusion of coagulable lymph or blood into its structure.

From the rare occurrence of inflammation of this gland, its pathological appearances consequent to inflammation have been scarcely noticed in the writings of pathologists.

Inflammation of Glandular Organs of Secretion.— Without entering into the disputes of anatomists, as to the form and texture which are necessary to constitute glandular structure, we shall merely state, that the most perfect glands are the lachrymal, salivary, submaxillary, sublingual, mammary, and prostate — the pancreas and testicle (*colourless glands*), and the liver and kidneys (*coloured glands*). Their external form is generally round or ovoid, and most of them consist of small lobules, connected by cellular tissue. For their size they are the most vascular parts of the body, a large supply of blood being necessary for the purpose of elaborating the various fluids secreted by glands.

When a glandular organ is inflamed, it increases in size, and its excretory ducts become enlarged and distended: the tissue of the colourless glands is of a slight rose tint: in the coloured, the natural redness becomes deeper, the injection extending throughout the interlobular cellular membrane. The excretory ducts are filled with fluid which is generally limpid, unless the inflammation be intense, when it becomes red, and even bloody. These anatomical appearances, however, pass off very rapidly after death.

Inflammation of a gland generally terminates in resolution; but if, from its intensity or improper treatment, it proceed to suppuration, the purulent matter forms in the cellular tissue of which the gland is partly composed, the proper substance of glands being not very susceptible of the suppurative process. When, however, the inflammatory action is very intense, it undergoes a species of suppuration; it loses its consistence, and to the softening succeeds infiltration with a thin kind of pus, the sensible qualities of which depend very much on the state of health and particular constitution of the individual.

When suppuration takes place in glands which have large secreting ducts, as the liver and kidneys, the mucous membrane with which these canals are lined sometimes assumes the suppurative action; hence, when pus is mixed with the fluid which the gland secretes, (the bile or urine for example,) it may be secreted either by the inflamed mucous lining of the duct, or there may be a communication between an abscess in the organ and the duct through which the matter is discharged.

These general observations being sufficient to give an idea of the effects of inflammation in glandular organs, we shall, without noticing specially the external glands, make a few remarks on inflammation of the internal organs of secretion— the *pancreas*, *liver*, and *kidney*.

1. The *pancreas* appears to be seldom the subject of inflammation and its consequences; in those cases which have been reported as instances of inflammation of this organ, the symptoms during life were not only very obscure, but the anatomical characters of the lesion not well defined.

In the cases which are reported, redness, more or less deep, and loss of consistence of the substance of this organ, with injection and infiltration of the interlobular cellular membrane, are the morbid appearances described. The inflammation does not appear to have extended through the whole structure of the gland, but limited to one portion of it.

When inflammation of the pancreas has terminated in suppuration, the small lobules of which the pancreas is composed assume a grey-red colour, and become soft, and finally so completely disorganized, as to lose all trace of their original structure. The purulent matter is in some cases diffused through the cellular substance; in other instances the pus is confined in a distinct cavity or cyst, the abscess sometimes forming a tumour of considerable size adhering to the surrounding viscera. Sometimes, again, the pancreas has been found hard and shrivelled in the centre of the purulent deposit. These pancreatic abscesses have been known to make their way across the cellular tissue of the mesocolon, and, by perforating this membrane, the purulent matter has escaped into the cavity of the abdomen.

2. Congestion of blood may take place in the parenchyma of the *liver*, from causes originating in the organ itself, or as the effect of sympathetic disturbance in some other part. Again, when there is any obstacle to the free return of blood to the right side of the heart, the blood accumulates in the liver, and thus passive hepatic obstruction or congestion is induced. When this takes place, the liver is of an uniform red colour, a little increased in bulk, and evidently changed in density or consistence. Under the pressure of congestion the blood-vessels sometimes give way, and the blood is diffused through its parenchyma, constituting what the French writers term *hepatic apoplexy*. This lesion may be the result of rupture of one or two of the larger hepatic vessels, or of exudation from the capillaries.

Inflammation of the liver is more common in warm than in temperate climates; and notwithstanding the frequency of its occurrence, its anatomical characters are not very distinctly laid down, which may arise from hepatitis being very rarely fatal in the inflammatory stage, so that few opportunities of ascertaining the morbid appearances occur. The appearances in inflammation of the liver differ according to its intensity, duration and extent. Though inflammation may occur either in the serous covering, or in its parenchyma, it appears to be much more frequent in the latter. Indeed, from the history of hepatitis, given by writers who have had extensive opportunities of observing the disease in hot climates, we are informed that inflammation of the capsule of the liver is of comparatively rare occurrence.

In the milder forms of hepatic inflammation the organ is slightly increased in size and density, and of a dark red colour, from accumulation of blood, which flows freely where an incision is made. These changes are more evident when the inflammation is circumscribed or partial, as the morbid may be then contrasted with the healthy structure. In the more advanced stage, or when the inflammation has been from the beginning more intense, the parenchyma is more or less softened, and very vascular, the vena portæ, mesenteric vessels, and mucous membrane of the duodenum, being gorged with blood.

The degree to which this hepatic softening occurs depends on the degree and duration of the inflammation. In the more intense cases, the tissue of the liver occupied by the inflammation is reduced to a soft lacerable pulp of a deep violet or brown colour.

When hepatic inflammation terminates in suppuration, the pus may be diffused through the parenchyma of the liver, so as to give it a green-yellow colour, the tissue in which it is infiltrated, and for some extent around, being softened and disorganized. In other instances the pus is confined in abscesses, varying in size, sometimes distinct from each other, but occasionally communicating by perforations. These abscesses may be bounded by the parenchyma of the liver only, or by a more or less completely organized cyst; they often acquire a very large size, in some instances containing several pints of pus.

The termination of abscess of the liver is various; —1, it may be discharged through an opening in the hypochondrium, or some other situation: 2, when adhesion between the hepatic abscess and some portion of the alimentary canal or kidney takes pla e, the pus may be discharged by the stomach, bowels, or kidney: 3, the abscess may burst into the cavity of the abdomen: 4, it may perforate the diaphragm and be discharged into the cavity of the chest or pericardium; or if an adhesion form between the hepatic abscess and the lung, the pus may be discharged through a perforation in the bronchial tubes by expectoration. Andral alludes to a case of hepatic abscess situated near the gall-bladder, emptying itself into it, and passing from thence into the biliary duct; and also to a case in which abscess of the liver communicated with the vena cava.

Gangrene of the liver, if it do really occur, must be regarded as an extremely rare termination of hepatitis, as no unequivocal instance of this lesion has been recorded. Mr. Annesley, whose extensive opportunities of observation entitle him to be regarded as an authority, states that he never observed it as a termination of hepatitis of warm climates.

3. Inflammation of the *kidneys* is characterized by obscure redness of the *tubular*, and bright-red colour of the *cortical* substance, the tissue of the former acquiring a degree of firmness, the latter becoming softened, and easily torn.

The emulgent vessels are generally turgid, and the inner membrane of the pelvis and infundibula red and injected, the redness often extending along the membrane of the ureters.

In more intense renal inflammation the tissue of the kidney becomes of a deep red or chocolate colour, and remarkably softened.

Inflammation of the kidney may terminate in resolution, softening, and induration of its parenchyma, or in the formation of pus. Purulent formations in the kidney may take place in three different modes. 1. The inflammation may commence in and be confined to the tubular or secreting portion, and pass into suppuration, in which case the uriniferous tubes, infundibula, and pelvis of the kidney, secrete purulent matter, which is discharged with the urine. In these cases the kidney is not enlarged in size, and the signs of inflammation are confined to the secreting part of the organ. 2. The pus may be infiltrated through the tissue of the kidney, accompanied with deepred colour and softening of its substance; a number of white spots, frequently mixed with blood, are seen, from which pus may be squeezed; they are often mistaken for masses of tubercle. This form may be the result of inflammation, or of general purulent diathesis, when pus is found in other organs. 3. The purulent matter may be collected in distinct abscesses. These may be of small extent, the surrounding parenchyma being scarcely altered; or the whole tissue of the organ may be transformed into a purulent sac, which, according to Andral, is generally multilocular, the septa consisting of hard lardaceous tissue. They may exceed in bulk the kidney itself, and thus produce a tumour distinguishable through the abdominal parietes.

The inflammation in some cases commences in the renal capsule, to which it may be limited, or it may extend to the adjacent portion of the kidney. In these cases suppuration generally follows, but the abscess is exterior to, and unconnected with the substance of the kidney, the structure of which is unaltered, though often, from the pressure of the abscess, diminished in bulk. Abscesses sometimes form in the abundant loose cellular tissue which lies beneath the peritoneum, and surrounds the kidney and its proper capsule. Morgagni gives a case of this kind, which contained four pounds of purulent matter.

Renal abscesses may be discharged in various ways:—1, the pus may pass off with urine; 2, it may burst into the abdominal cavity and produce peritonitis, which is speedily mortal; 3, the abscess may form an adhesion and open into the colon; 4, it may be discharged externally by a perforation in the loins.

Gendrin has quoted a case from Ledran, in which a renal abscess opened at the loins, and the matter having forced its way in the sub-peritoneal cellular tissue down under Poupart's ligament and around the crural vessels, was also discharged at the inner part of the thigh. He alludes also to that case related by De Haen, in which an abscess in the left kidney, after destroying the substance of the organ, formed an adhesion to the diaphragm, which it perforated, and destroyed the inferior lobe of the left lung, the kidney and lung thus forming one large sac.

Causes of Inflammation.—There are few circumstances connected with pathology more obscure and unsatisfactory than the etiology of diseases. This is fully exemplified in the obscurity in which the origin of almost every form of inflammatory disorder is involved. Many, indeed, arise without evident cause, constituting what has been denominated by practical writers spontaneous inflammation—a term which simply denotes that the causes are so obscure as to elude observation.

It would appear, however, that certain circumstances predispose the system or render it more liable to inflammation; this predisposition may exist either in the system in general, or it may be confined to a particular region, organ, or tissue.

The *predisposing* causes may be arranged in two classes, the first depending on general sanguineous plethora; the second are connected with local determination of blood. Practical writers have usually mentioned the sanguine temperament among the individual causes which predispose to inflammation. Persons who possess this temperament are generally supposed to have a superabundant quantity of blood, whereby the vessels, more especially the capillaries, are kept in a state of undue distension, the blood having at the same time great consistency or richness. It is also asserted that adults, especially male adults, and those possessing what is called a strong constitution, are more predisposed to inflammatory diseases. It has always appeared to us, however, that these views are not supported by facts and observation, and in our own experience, we have generally found that weak and delicate persons are much more frequently attacked with inflammation than the more robust and vigorous. Not less unsupported by evidence is the notion entertained by Van Swieten, that serous evacuations, such as profuse sweating, salivation, or copious flow of urine, predispose the body to inflammation, in consequence of the blood acquiring greater consistence from the abstraction of its watery principles. A predisposition to inflammation, or tendency to particular local determinations of blood, is observed at certain periods of life. We accordingly find that there is a greater tendency to cerebral fulness in infancy and childhood than at other ages; towards puberty, we observe fulness of the pulmonary system, which accounts for the frequency of nasal and pulmonary hemorrhage at this period. In adults, on the other hand, diseases of the abdominal viscera connected with vascular fulness are more common, though it should be kept in mind that congestions or irregular distributions of blood are more common than organic inflammation. It is often of great consequence to discover those circumstances which give a predisposition to inflammation in particular organs and tissues. These may often be traced to a state of partial or local plethora, connected with causes which are inherent in the part itself, though a predisposition to local inflammation is frequently acquired. Thus the undue exercise of an organ frequently predisposes it to inflammation, an illustration of which is the tendency to ophthalmia or retinitis induced by long-continued use of the eye, or straining this organ in examining very minute objects; in the effect of long-continued application to study in producing slow, insidious, cerebral fulness; in the effect of long-continued exposure to cold in laying the foundation of pulmonary diseases; and in the tendency to hepatic inflammation engendered by residence in a warm climate.

It is also a well-known fact that a predisposition to inflammation is given by previous attacks. This is so much a matter of experience and observation that it is scarcely necessary to adduce examples in illustration.

Whatever circumstance or combination of circumstances breaks up the general powers predisposes the body to inflammatory diseases, by rendering it unable to contend against the exciting causes. It is in this way that undue bodily or mental exertion, the depressing passions, long-continued watching, impure air, improper or scanty supply of food, or insufficient clothing, may be regarded as predisposing causes of inflammation.

It is worthy of remark that the predisposing causes have a considerable influence in determining the type of the subsequent inflammation, as well as the nature and extent of the curative measures. Those inflammatory diseases which arise suddenly, are generally connected with a full habit, and require active treatment; while those which come on more slowly, or in exhausted constitutions, are of the asthenic character, requiring greater circumspection in the nature and extent of antiphlogistic remedies. In such cases we are often obliged to support the general powers, when the local symptoms render the topical and even the general abstraction of blood, among other antiphlogistic measures, expedient.

The *exciting* causes of inflammation are no less obscure than the predisposing. Many pathologists have expressed their doubts as to the possibility of inflammation ever arising spontaneously. There can be no doubt that in many instances organic inflammation appears without our being able to discover its cause. Thus, inflammation is often set up in the brain, chest, or abdomen, without any evident cause. The inflammation is then termed spontaneous, in contradistinction to accidental inflammations, which are so called from their originating in causes applied immediately to the part affected. It would be unreasonable to say that in such cases the inflammation arose without some cause, though it may not be possible to detect it.

There has been too great disposition, on the part of systematic writers, to take for granted the ordinary list of exciting causes of inflammation. A little reflection will soon convince the patient observer of nature, that the causes of diseases are more mysterious than we are led to suppose from perusing systematic treatises. If the etiology of diseases were studied at the bedside, the obscurity of this department of medicine would be apparent; and it has been constantly observed that most idiopathic inflammations are developed by causes which elude our observation.

The effect of atmospheric causes on diseases in general has attracted the notice of physicians from very early ages. Inflammatory disorders are certainly more common in cold, variable, moist weather, and more especially when the wind blows from the north; hence, in the winter and spring, we observe the various types of inflammatory diseases. The mucous membranes seem to suffer more particularly in cold moist weather, and the serous membranes and parenchyma of organs in cold dry weather; while in summer cutaneous inflammations (idiopathic or secondary) are observed to be most frequent.

Inflammation may arise from injuries of various kinds, such as wounds, whether punctured, incised, lacerated or contused; from the irritation of foreign bodies, such as renal, biliary, gouty, and salivary concretions; and from pressure, as in the instance of a bandage or ligature applied to the extremity; or in the example of pressure produced on an internal part by aneurismal or other kinds of tumours, whether solid or fluid, the pressure of which causes inflammation in the parts to which it is applied.

Another exciting cause of inflammation is the direct application of heat. This is exemplified in the effect of exposure to the rays of the sun in producing inflammation of the brain or external integuments of the head and face, and in the effect of heat in producing scalds and burns.

The effects of cold, as an exciting cause of inflammation, more especially if combined with moisture, are well known. We observe inflammation occur in parts to which the external air has free access—the eye—the ear—the tonsils—the larynx or trachea, and the mucous membrane of the lungs, after exposure to cold. These are instances of the effects of the direct application of cold. At other times the application of cold is followed by inflammation of a distant organ, an indirect effect being sometimes thus produced on an internal part, by the local application of cold and moisture. Thus a person who gets the feet thoroughly wet may afterwards have inflammation of the throat, of the lungs, or intestines, according to some local but still unexplained predisposition. We have another exemplification of the effect of cold in producing inflammation in frost-bite, in which very often rapid destructive inflammation is set up from the application of intense cold.

Undue exercise of the functions of an organ may become not only a predisposing, but an exciting cause of inflammation. In this way undue exercise of the mental powers is a frequent cause of inflammation of the brain. In like manner, also, inflammation may be produced in the eye, as is frequently observed in persons who are obliged to use this organ unduly in their daily avocations. Inflammation of the vocal organs is a common consequence of long-continued loud speaking; hence noisy maniacs frequently become hoarse from the constant vociferation in which they indulge.

Some substances, when taken into the stomach as remedies in disease, produce inflammation of particular parts. We have an example of this in the inflammation of the salivary glands, and sometimes of the skin, produced by the exhibition of mercury, or in the gastro-intestinal inflammation which is the result of the employment of arsenic as a remedy in some diseases, but more especially when it is taken in such quantity as to act as a poison. To the same head of causes of inflammation, we may refer the various examples of local irritation and its consequences arising from irritant poisons. According to Dr. Christison, these effects of local irritation vary from the slightest redness to ulceration and even gangrene.

Thus externally, alcohol reddens the skin; cantharides irritates the surface of the true skin, and causes vesication; tartar-emetic causes deep-seated inflammation of the true skin and a pustular eruption; the juice of manchineel, spreading inflammation of the subcutaneous cellular tissue; arsenic has all of these effects, as also death of the part and subsequent sloughing. Internally, alcohol reddens the stomach as it does the skin, but more permanently; while other substances, such as the diluted mineral acids, nitre, arsenic, cantharides, euphorbium, and the like, may cause all the phenomena of inflammation in the stomach and intestines, namely, extravasation of blood, effusion of lymph, ulcers, and gangrene. (Christison on Poisons, second edit.)

There are other substances belonging to the class of irritants — the acro-narcotic poisons which have a compound action, the one local and irritating, the other remote, producing an impression on the nervous system. To this class belong the atropa belladonna (deadly nightshade,) the datura stramonium (thorn-apple), and the nicotiana tabacum (tobacco).

The morbid animal poisons, as exciting causes of inflammation, belong also to this head. Some of these have a local action only, as the poison of itch or syphilis; more generally, however, the poison, though introduced locally, affects the general system, as in the instance of small-pox and cow-pox, and the poison of hydrophobia. It would appear, moreover, that some animal poisons operate through the medium of the blood. It is probably in this way that measles, scarlet fever, plague, the natural or uninoculated small-pox, and some other acute disorders, are produced. Many of these diseases, as is well known, give rise in their progress to various local inflammations, the danger to life depending in a great measure on the severity of these local lesions.

Terminations or Effects of Inflammation.—The mode in which inflammation terminates depends on several circumstances, more especially the nature of the exciting cause, the intensity and duration of the symptoms, the peculiar constitution of the individual, the curative measures adopted, and the stage of the disease at which they have been employed.

1. *Resolution.*—Inflammation may gradually subside by the unassisted efforts of the system, constituting spontaneous resolution; or its progress may be arrested by the employment of remedies before it has effected any change of structure in the part. Resolution is not only the most favourable, but the most common termination of inflammation; it is indicated by the progressive abatement of the local as well as general symptoms, and especially by the restoration of the natural functions of the part. When resolution takes place suddenly, the French writers apply the term *delitescence* (from the verb *delitesco*), implying sudden disappearance; this is exemplified when a primary inflammation suddenly disappears and attacks another organ. This sudden decline of the inflammatory action is less frequently observed, however, than the more slow and gradual process of resolution.

The resolution of inflammation is often preceded or accompanied by *metastasis*, or translation of the disease from one part to another. We have an instance of this in the common occurrence of inflammation suddenly leaving one tonsil and seizing on the other, in the sudden recession of the glandular inflammation in mumps, and the subsequent inflammation of the testicle in the male, or the mamma in the female. In gouty and rheumatic inflammation, such sudden translation is frequently observed. The articular inflammation in gout sometimes recedes from the foot, and appears in the hand or knee, and occasionally attacks some internal organ, the stomach or brain. The sudden recession of rheumatism from joint to joint is a still more common occurrence, and is the cause of the generally protracted nature of this disease. A still more dangerous effect of the recession of rheumatic inflammation is, when it leaves the joints and fixes on the membranes of the brain or the serous covering of the heart.

Physicians, from observing the complete cessation of inflammation, when a secondary disease is produced, have endeavoured to imitate nature, and by means of derivation or counter-irritation applied in the vicinity of an inflamed organ, to establish an internal disease, in the hope of withdrawing the inflammation from an internal to the external and less important part: these measures now form an important part of the local treatment of inflammation. (See COUNTER-IRRITATION and DERIVATION.)

When inflammation is about to terminate in resolution, various changes take place according to the stage and intensity of the inflammatory action, and the structure of the inflamed part. In the slighter grades of the disease, the frequency of the circulation diminishes, the blood-vessels contract in their diameter, so that those which, during inflammation, were so much dilated as to admit the red particles of the blood, again receive only a colourless fluid. When the inflammatory action has been more severe, the resolution is accompanied, if not effected, by an increase of the natural secretion of the part. If the inflammation occur in a serous membrane, the exhalants secrete an undue quantity of serum, or even coagulable lymph, which goes on so long as the inflammatory action continues; but whenever resolution takes place, the further progress of effusion is not only arrested, but the fluid already thrown out is gradually removed by absorption. When inflammation occurs in a mucous membrane, the natural secretion, though at first diminished, is afterwards increased, and more or less altered in its quality, more particularly if the inflammation have passed into the chronic stage.

Thus we find in bronchitis and muco-enteritis, that though in the primary stage of inflammation of these membranes the natural secretion is suppressed, as the diseased action proceeds, the natural secretion is first restored, and afterwards increased in quantity, and finally altered in quality. The error of attempting to check the secretion from an inflamed mucous membrane, especially in the early stage of the disease, the increased discharge being the natural solution of the diseased action, is, therefore, obvious. Besides these local circumstances which are observed when inflammation terminates in resolution, we find occasionally other changes take place, which, from their supposed influence in effecting this desirable solution, have been considered critical. There is sometimes an increase of the perspiration, or moderate diarrhœa, but more generally the urine exhibits marked alteration in its physical and chemical characters. While the inflammatory action is proceeding, the urine, though high-coloured, is clear, and does not, on cooling, deposit a sediment; but when the inflammation is disappearing, it deposits, on cooling, a red sediment. The following ingenious explanation of this appearance of the urine is given on the authority of Dr. Prout.

In healthy urine there is lithate of ammonia, which is pale and white, as also a yellow colouring matter, the nature of which is unknown, but which is thought to be, perhaps, a modification of lithic acid. If to lithate of ammonia out of the body what are called the *purpurates* be added, a pink substance is immediately produced, such as is observed in hectic fever; and if the urine have its usual yellow colouring matter, a mixture of that with the pink appearance produced by the purpurates and the lithate of ammonia gives a red colour, pink and yellow mixed together, forming a red colour. In this diseased state we are informed by chemists that nitric acid in excess is formed in the urine, which acts on the lithic acid, and converts some of it into a new acid called the *purpuric*, which, uniting with the salts of the urine, forms the purpurates; and these purpurates, mixing with the lithate of ammonia, which is always in the urine, produce a pink deposit, which, united with the yellow colouring matter, becomes red. The lithate of ammonia and soda are formed in some degree of excess in the urine under inflammation, and nitric acid is produced; which, as has been stated, acting on the lithic acid, produces purpuric acid; and thus the formation of the purpurates is explained. Those mixing with lithate of ammonia produce a pink substance; and when this unites with the yellow colouring matter, the colour is changed to red. The cause of the urine being high-coloured or red, without sediment, till the inflammation declines, is this, that the same substances are in the urine, but held in solution by the activity of the complaint; but when it declines, an excess of lithic acid is formed, producing *super-lithates*, which are very insoluble; and, therefore, a great portion of them falls down in the form of a precipitate: hence the red sediment. (Elliotson's Lectures on Inflammation.)

The resolution of inflammation is sometimes accompanied by hemorrhage, with which inflammatory action is often intimately connected. Critical hemorrhages may take place either immediately from the inflamed part or from some neighbouring organ. We have an instance of the one, in the hemorrhage which succeeds to inflammation of mucous membranes, and of the other, of epistaxis in apoplectic or inflammatory states of the brain. These spontaneous hemorrhages are always followed by most marked relief of the local and general symptoms.

When inflammation does terminate in resolution, it effects other morbid changes in the inflamed tissue. The terminations, or, more properly speaking, the effects to which we allude, are *Effusion*, *Suppuration*, *Mortification*, *Ulceration*, *Induration*, *Softening*, and *Hemorrhage*.

2. *Effusion*. The exemplification of effusion as a consequence of inflammation is best illustrated in the serous membranes. After the violence of the inflammatory action has subsided, and the natural secretion of the membrane, which, during the primary stage of inflammation, had been suspended, is restored, an increased effusion of serosity takes place. The fluid which in these cases is secreted, and which happens only when the inflammation is moderate, bears so strong an analogy, both in its physical and chemical characters, to the serum of the blood, as to have received the appellation of serosity or serous fluid. It is generally of a pale straw colour and transparent, though occasionally, when the inflammation is a little more intense, it contains a small proportion of albumen, which renders it slightly turbid. When the inflammatory action has been more violent, the fibrinous principle of the blood is separated; the admixture of which with albumen and serum constitutes coagulable lymph. It is this product which, when mixed with serous fluids, renders them turgid; the flakes of coagulable lymph, from their greater specific gravity, generally falling to the bottom of the cavity in which the effusion takes place, lining at the same time the surface of the inflamed membrane, and constituting that product termed *false membrane*.

When an intense inflammation has lasted several days, the fluid acquires a yellow colour from admixture of purulent matter: when this is considerable, the effusion very nearly resembles in appearance well-formed pus; but it still contains a large proportion of coagulable lymph and serous fluid.

In the commencement of the formation of false membranes, the exudation is soft and without consistence; but from the thinner parts being gradually absorbed, they become more dense, and adhere to the inflamed membrane, forming webs of various figures, which extend from one point to another of the surface on which they arise. When subjected to pressure, they give out a large proportion of fluid consisting of serum mixed with albumen; the solid substance appearing globular when viewed with the microscope, and, according to the analysis of Davy, consisting chiefly of fibrine.

False membranes often become completely organized, and of a distinctly cellular structure, capable of being injected; and when the inflammatory action ceases, they are converted into cellular tissue covered with a serous membrane, and afterwards liable, like serous tissues, to inflammation.

Fibrine is also sometimes effused from inflamed mucous membranes, and gives rise to the formation of false membranes, such as that which is effused in the larynx and trachea, or from the mucous surface of the intestines or uterus. The false membranes formed in mucous cavities, however, are less consistent than those which are effused on serous surfaces, probably owing to their containing less of the fibrinous principle. When an inflamed mucous membrane is about to terminate in the exudation of a false membrane, an unusual quantity of viscid mucus is secreted, which gradually becomes more consistent from the admixture of fibrine which is effused in the subsequent stage of the inflammatory action. These pseudo membranes, as was stated before, generally bear the mould of the cavities in which they form.

[When the effusion of liquor sanguinis is examined by the microscope at the commencement of its becoming organized, a number of exudation corpuscles, formed as the fibrin coagulates, is seen in it. These have the appearance of regular cells, arranged in layers, and adhering together by an unorganized substance. Some hours later a fibrous character presents itself, which is supposed to be owing to the adhesion of the cells together in lines. Between the cellular fibres a considerable amount of cystoblastema yet remains, and they may be readily separated or torn in any direction A vascular network next appears, which forms a communication with the vessels of the subjacent surface. (Gerber, *General Anatomy*, by Gulliver, Lond. 1842.)

According to M. Andral, (*Hématologie Pathologique*, Paris, 1843, or Amer. edit. Philad. 1844,) two matters—the one globular, the other reticular—characterize, in the solid, the morbid process which we term inflammation. The reticular matter is nothing more than fibrin, perfectly similar to that which exists in the blood;—the globular matter, he thinks it probable, is also fibrin, but altered in its nature, and arrested in its coagulation. These two matters have very different destinations. The one—the reticular—is susceptible of passing into the organized state: vessels may be seen ramifying in it, and it may become a tissue. It is this which forms adhesions, and under the name of 'coagulable lymph' is interposed between the lips of wounds, and becomes the medium of their reunion. In place of being injurious by its presence, it is, consequently, an instrument of reparation for the tissues, and ultimately becomes completely identified with them. The other, on the contrary—whether it have a common origin or not with the reticular—can never remain in the textures without disturbing more or less the whole economy. It is incapable of organization; exhibits no trace of vitality, and is rejected by the organism. If not eliminated, disease results, and the elimination itself is frequently not accomplished without the supervention of unpleasant symptoms.]

The organization of coagulable lymph gives rise also to the process of *adhesion*—an operation of nature by which surfaces of parts which have been recently divided become re-united, the lymph becoming a living intermedium whereby the continuity of the part is ultimately restored. A knowledge of the fact that parts which have been divided may be again united by adhesive inflammation, has laid the foundation of many of the most important improvements in surgery.

The mode in which divided parts are united, and injuries repaired, termed union by the first intention, is similar to that which takes place in the formation of false membranes. If a surface which has been divided, an incised wound, for example, be examined a few hours after the solution of continuity has taken place, it will be found covered with a layer of coagulable lymph. Dr. Thomson made some experiments upon animals with the object of ascertaining the earliest period at which coagulable lymph is effused from the surface of a wound; he observed a distinct layer of lymph covering wounds he had made within less than four hours after they had been inflicted; though he thinks a longer period may be required in the human subject, in different persons, in different textures of the same individual, and in the different states of health and disease. The exudation of the lymph is speedily followed by the formation of blood-vessels, which often become, in the course of a few hours, so large as to be capable of being injected. This is the state of re-union termed by Mr. Hunter *adhesive inflammation*.

In many instances the reparation of an injury or divided surface is effected by a different process—that of *granulation*, termed by the older writers union by the second intention. The process of granulation takes place, when from various circumstances wounds do not unite by adhesive inflammation, or when there has been a considerable loss of substance in a part, as in abscesses, ulceration, and gangrene. In these cases a layer of coagulable lymph is effused on the surface of the wound, which, as in the process of adhesion, becomes penetrated with blood-vessels, and thus a living intermedium is formed. Soon afterwards the surface is covered with purulent matter thrown out by a peculiar action of the vessels of the part, in which circumstance, besides the non-union of the divided tissue, the granulating differs from the adhesive process. Granulations assume the appearance of small red points and eminences, and according to Dr. Thomson, the mode in which nature effects their formation may be seen by injecting and carefully examining the internal surfaces of abscesses, or the granulating surfaces of healthy sores or ulcers. From numerous observations made in this way, it appears the exudation of a layer of coagulable lymph may be regarded as the first step in the process of granulation. The second consists in the penetration of this lymph with blood-vessels, nerves, and absorbents; the third, in the inosculation, or union by open extremities, of the vessels in these granulations; and in the last step, if it may be called so, of their formation, the granulations are covered over with cuticular substance by which the further secretion of pus is prevented, and the process of healing by granulation completed. (Lectures on Inflammation.) In this way the process of cicatrization is explained.

The subject of adhesive inflammation was minutely investigated by John Hunter, and in the chapter of his work on inflammation, entitled "On the Use of Adhesive Inflammation," he has pointed out this admirable contrivance of nature in preventing the extension of diseased action, and in repairing its effects in different structures. Mr. Hunter has also given a description, which has never been excelled in modern times, of the various processes by which this reparation is effected. The first step of the process by which solutions of continuity, whether simple incised wounds or loss of substance in any organ or part of the body are united or regenerated, is adhesive inflammation, which varies in intensity according as the reparation is to be accomplished by the first intention (adhesion), or by the process of suppuration. In the first mode, the inflammatory action never reaches the stage of suppuration; in the latter the inflammation should be moderate in order to insure cicatrization. It is well known to surgeons, that if a wound be irritated during the process of union by the first intention, the adhesive readily passes into the suppurative inflammation, so that the union by the first intention is frustrated; if, on the other hand, the surface of a suppurating wound be irritated during the healing by granulation, cicatrization is retarded and often entirely prevented.

The necessity, therefore, of moderating inflammation in the treatment of wounds, that this action, which is indispensable for the accomplishment of union by adhesion and cicatrization, may never exceed proper limits, or of occasionally stimulating the surface of a sore when the healing process is languid, is thus explained.

[It has been maintained, however, by Dr. Macartney, of Dublin, after a comparative survey of the operations of reparation and inflammation, as performed in the different classes of animals, (*Treatise on Inflammation*, Dublin, 1838,) that the powers of reparation and reproduction are in proportion to the indisposition or incapacity for inflammation;—that inflammation is so far from being necessary to the reparation of parts, that in proportion as it exists, the latter is impeded, retarded or prevented,—that when inflammation does not exist, the reparative power is equal to the original tendency to produce and maintain organic form and structure,—and that it then becomes a natural function, like the growth of the individual, or the reproduction of the species.]

In every tissue, adhesion is effected, as before explained, by the effusion and subsequent organization of lymph, which in the course of time is transformed into a new substance, similar to cellular or fibro-cellular tissue, which adheres to the lips of an incised wound, and constitutes the medium or bond of union by the first intention; or it is deposited in the cavity of suppurating wounds, and upon which granulations are subsequently deposited, so as to fill up the vacuity which has been occasioned by the solution of continuity.

[If examined with a microscope at the commencement of the process of organization, it is seen to contain a large number of exudation corpuscles. In a short time, these corpuscles present the appearance of regular cells, disposed in layers, and adhering together by an intermediate unorganized substance, bearing a strong resemblance to the cells of tesselated epithelium. Some hours later, the mass exhibits an evidently fibrous character, owing to the adhesion of the cells together in lines, their form being prolonged in the same direction. A vascular rete next makes its appearance and forms connections with the vessels of the subjacent surface: the first appearance of this network is in the form of transparent arborescent streaks, which push out extensions on all sides; these encounter one another, and form a complete series of capillary reticulations, the distribution of which very nearly resembles that which has been seen in the villi of the intestines. Before the vascular rete appears, pale-coloured cytoblasts are produced, which, after the completion of the rete, pass over into the nearest capillary veins, being pushed on by the blood, which is brought from the nearest arteries; and in this manner the circulation is established. (Carpenter, *Principles of Human Physiology*, § 600.)]

In the reparation of cellular tissue, the first stage is the effusion of lymph, which becomes gradually organized, and transformed into a texture so similar to the primary tissue, that it is impossible to distinguish the one from the other except by its greater degree of density or hardness, and that its cells do not communicate so freely, for in œdema the cicatrices of wounds or abscesses do not fill with fluid.

Serous membranes become united by adhesive inflammation, either by union of the two serous surfaces, as we observe in pleuritic adhesions, or when there is a solution of continuity of this membrane, as in wounds of the lungs or intestines. Dr. Thomson states, that in some experiments in which he removed a portion of the pleura pulmonalis, it appeared to be regenerated, as he was unable to distinguish easily the cicatrix from the surrounding parts. Gendrin also found the peritoneum thickened at one point in which ulceration of the intestine had commenced in the peritoneal tunic.

In solutions of continuity of the skin, when union by the first intention takes place, adhesion is effected by fibro-cellular tissue, which nearly resembles in formation the cutaneous structure. It differs, however, in some respects, chiefly in the non-regeneration of areolæ, indentations, or fatty matter. In extensive losses of the cutaneous tissue, the reparation is effected by suppuration, granulation, and the ulterior stage of cicatrization; but although the newly-formed substance is covered with an epidermis so as to resemble the original skin, it never acquires the perfect organization of cutaneous texture; it is less yielding, movable, and elastic, and without indentations by which sound skin admits of distension. Its vitality is also less active, for, as is well known to surgeons, when an old sore breaks out, the cicatrix is gradually destroyed.

A similar process to that just described appears to take place when portions of mucous membrane are destroyed by ulceration, viz. the effusion and organization of lymph, and the formation of an organized cellular membrane. The newly-formed tissue, however, has none of the properties of a mucous membrane, and never performs the function of secretion. The cicatrix is generally white, contracted, and is neither endowed with villosities nor follicles. We have examples of the healing or cicatrization of mucous membrane in ulceration of the throat, bronchia, and urethra; and in the follicular ulceration which accompanies some forms of fever, and also in ulceration of the mucous membrane of the stomach, or of the colon in dysentery.

The adhesive inflammation of blood-vessels is exemplified in wounds, or when a ligature is applied to an artery or vein. Effusion of lymph takes place both within the canal and on the surface of the vessel: this fluid becomes organized and finally transformed into a firm fibro-cellular web, which becomes closely connected with the internal and external tunics, and thus obliterates its canal. The fibrine of which the plug is composed is also organized, and may be even injected, showing the distinction between this substance and a clot of blood.

A similar process takes place in inflammation of veins, which we have shown to be more susceptible of adhesive inflammation than arteries; and that adhesive inflammation of this system of vessels frequently occurs, and gives rise to important and often dangerous diseases.

In nervous tissue, adhesive inflammation is observed in the reparation of various lesions of the brain and nerves, though pathologists are generally agreed that regeneration of the cerebral and nervous pulp never takes place. The process of adhesive inflammation of the cerebral tissue is exemplified in the obliteration of apoplectic or hemorrhagic cysts, in which, according to Rochoux, the appearance of the effused blood differs according to the duration of its effusion. When death ensues quickly, at the end of three or four days for example, it is in the form of soft blackish clots: after a month or six weeks it becomes firmer, assumes a deep brown colour, and resembles the blood of aneurismal tumours. At a more remote period it becomes still more compact, and of a pale red colour, bordering on ochreous matter; and lastly, it is entirely absorbed. Around the coagulum a layer of lymph is effused, which becomes organized and transformed into a cellulo-fibrous cyst, which separates the clot from the cerebral substance. When the coagulum becomes completely absorbed, the cyst gradually contracts, till its walls approximate, and finally adhere by thin bands of cellulo-fibrous tissue, which in some cases cross the cyst in various directions, so as to connect its opposite sides at these intersecting points. In many instances, however, the cyst remains open and is filled with a turbid fluid.

In wounds or laceration of nerves, the divided extremities of the cord are united by lymph, which is gradually transformed into firm fibro-cellular tissue. From experiments which have been made with the view of ascertaining whether the true nervous pulp be regenerated, it is now generally admitted that such reproduction does not take place, the substance of the cicatrix not being capable of transmitting nervous impressions.

When muscular tissue is divided or destroyed, the reparation is not effected by the regeneration of muscular substance, but by very firm fibro-cellular tissue. This newly-formed substance becomes more firm according to the extent to which the extremities of the muscle are separated. When this is considerable, the intervening substance becomes almost ligamentous, but never acquires either the appearance or properties of muscular fibre.

When solution of continuity or loss of substance of fibro-cartilaginous tissue (cartilage or ligament) takes place, the structure becomes swollen, inflamed, and softened; to which succeed effusion and organization of lymph, which is in process of time converted into dense fibro-cellular tissue; but it is in many respects dissimilar to the primary or original tissue.

The adhesive inflammation of bone is effected first by the effusion of lymph from the periosteal and medullary arteries, softening and swelling of fractured extremities of the bone, the subsequent organization of their lymph, and its successive transformation, first into fibro-cellular tissue, then into a semi-cartilaginous substance, on the surface of which there are subsequently deposited a number of points of osseous substance. These points of ossification cohere, and form a thick irregular soft bony callus. The thinner parts of this callus are gradually absorbed, the solid bony substance alone remaining; and by the further absorption of the softer osseous particles, the medullary and cancellated structure of the bone becomes ultimately formed.

[It has been generally supposed, that the processes of granulation and suppuration, which are attended with much local inflammation, and constitutional disturbance, when the surface is large, are the only means by which an open wound can be filled up. Occasional instances, have, however, occurred, in which large wounds have closed under the clot of blood by which they were at first covered, without any suppuration or other symptom of inflammation; and in these it has been found, that the new surface much more nearly resembles the ordinary one, than the cicatrix does, which follows granulation. Dr. Macartney (*op. cit.*) terms this the *modelling process*, and regards it to be precisely analogous to that which is concerned in the ordinary process of growth, and in the reproduction of whole parts, which takes place in the lower animals without inflammation. The most effectual means of promoting this kind of reparative process, and of preventing the interference of inflammation, vary according to the nature of the injury. The exclusion of air from the surface, and the regulation of the temperature, would appear to be the points of most importance. Dr. Macartney insists also on the constant application of water dressings. (Carpenter, *op. cit.*, §§ 602 and 603.)]

3. *Suppuration.*—Inflammation may also terminate in suppuration or the formation of a fluid termed pus. Various opinions have been entertained as to the mode in which this fluid is produced.

The older writers ascribed it to the breaking down of the solids, and the changes subsequently induced in extravasated blood; some regarded it as the effect of putrefaction of the serum or of the chyle, while others imputed its formation to the wasting or melting down of the fat. In modern times the generally received opinion is, that pus is separated from the blood by a peculiar action of the blood-vessels of an inflamed part, analogous to that of secretion; but in what way this fluid is elaborated is as little understood as the mode by which the various secretions are formed from the parent streams. It would appear, from experiments made on this subject, that pus is formed by a gradual conversion of the coagulable lymph into this fluid. For a detailed account, however, of this process, the physical and chemical character of pus, as well as its mode of formation in different tissues and organs, we beg to refer to the articles Abscess and Suppuration, and to the section of this article, *Theory of Inflammation.*

4. *Mortification.*—Mortification, or the complete death of a portion of the body, although produced by various causes, is not an unfrequent termination of inflammation, though it is a more frequent consequence of acute than of chronic inflammation. The terms gangrene, mortification, and sphacelus, have been used synonymously by many writers. Dr. Thomson has proposed to employ the term *gangrene* to express that stage of mortification which precedes the death of the part; and *sphacelus*, to denote its complete death or mortification, the circulation and sensibility, being completely destroyed.

When gangrene occurs as the effect of inflammation or other causes, or arises spontaneously, it is announced by a change of colour, sensibility, and temperature in the inflamed part. The bright red colour of inflammation is replaced by a deep purple, livid, or blue appearance, which soon passes into a dark brown or black; the affected part becomes insensible to the action of stimuli, while at the same time its temperature is diminished. It loses also the dense elastic feel which it had acquired during the inflammatory state, and becomes soft and flaccid; and if the mortification occur in the skin, the cuticle is raised in vesicles (phlyctenæ) which are filled with a yellow or bloody serum. A putrid odour begins soon after to be exhaled, which increases with the severity of the other symptoms, the progress of which is sometimes rapid, at other times more slow.

The complete death of the part is announced by a great decrease of temperature, a total loss of sensibility, and consequently cessation of pain, and a crepitous sensation produced by the pressure of air as a consequence of putrefaction. It is also known to anatomists, that the structure of a sphacelated part is so completely changed that an injection cannot pass into the vessels.

When mortification occurs in external parts, recovery frequently takes place even under the most unpromising circumstances. In internal organs it is almost invariably a fatal lesion. The symptoms which denote mortification in parts of the body important to life are, sudden cessation of pain, remarkable depression of the powers of the system, with symptoms referable more to the typhoid than the inflammatory character; there is great restlessness and uneasiness, but not arising from pain; the countenance becomes anxious, the features shrunk, and the aspect wild and cadaverous; the pulse small, rapid, and irregular; hiccup, followed by delirium and cold sweats, precedes the fatal issue.

We have already stated that mortification is more frequently induced by acute than by chronic inflammation. It is, however, important to bear in mind, that the death of parts is not always to be explained either by the degree or duration of inflammation. In certain epidemics, and in some conditions of the system, a state of local vascular excitement, amounting to little more than congestion, is followed by sphacelus of the affected parts. This is seen in the throat during the prevalence of malignant scarlatina, and in some forms of erysipelas: in malignant, eruptive, and typhoid fevers too, the inflammation produced in those parts of the body subjected to pressure or friction frequently terminates in gangrene.

There are few parts of the body which are not subject to gangrenous inflammation. Inflammation of the brain, though subject to all the changes consequent to inflammation, rarely if ever terminates in gangrene, though its membranes have been found in a mortified state after external injuries. There are certain tissues, however, in which inflammation is more apt to terminate in gangrene than in others. Nature seems also to have endowed the vascular system with a remarkable power of resisting mortification. Surgeons have frequent opportunities of witnessing large blood-vessels exposed, and apparently in a sound state, when the surrounding structures are completely destroyed by gangrene or ulceration. It is well known that in gangrenous parts no hemorrhage follows the division of the sphacelated parts, or even an incision made several inches above the boundary between the dead and living parts. This is owing to the arteries being filled with a coagulum of blood, which adheres to the inner surface of the vessels so firmly as to resist the impulse of the blood when they are divided. In one instance, related by Mr. O'Hallason, no bleeding followed the removal of a limb, though the incisions were made four inches above the seat of gangrene: and Dr. Thomson saw, in a case of mortification of the thigh, a coagulum of blood in the external iliac artery, extending as high as the origin of this vessel from the aorta.

On the other hand, we observe that inflammation more readily passes into gangrene in some tissues and organs than in others. It is observed more frequently, as a consequence of inflammation, in the skin and cellular membrane, in the organs of digestion and respiration, than in other parts of the body. Mortification takes place also more rarely, and makes slow progress in muscular, ligamentous, and tendinous structures.

Besides the occurrence of mortification from inflammation and other external causes, it may arise, without previous inflammation, from the introduction of acrid poisons, from lightning, or the near approach of cannon-balls, or from animal poisons, such as that of the viper, cobra di capello, or the rattle-snake.

Mortification takes place not only as an effect of inflammation, and from the other circumstances just enumerated, but as an idiopathic disease. This form differs in some respects from that arising from the causes alluded to, and has been distinguished by the term *dry gangrene*, from the dry appearance of the mortified part, the skin, cellular tissue, muscles, tendons, and ligaments, being hard and dry, and showing no tendency to putrefaction. It generally occurs in the lower extremities; and from the arterial trunks being almost invariably ossified, it has been supposed that this form of gangrene arises from this state of the blood-vessels.

It is a remarkable but well-ascertained fact, however, that dry gangrene may be also produced by eating unsound rye. The rye-plant or rye-corn (*secale cereale* of Linnæus) is used in some countries, particularly in the north of Europe, as an article of food, and also affords, by distillation, an ardent spirit. Bread made from rye is less nutritive but more aperient than any other kind. This grain is liable to a morbid growth, more particularly when great heat succeeds to heavy rains. It is a black curved excrescence, not unlike the spur of a fowl, which grows on the spike, and is sometimes found in such quantities as to form nearly one fourth of the produce of the rye. It is called *secale cornutum*, or the cockspur in rye. In France it is known by the name of the ergot (*siègle ergoté*). This diseased growth is attributed to the destructive operation of an insect which perforates the rye-corn and destroys its parenchyma.

Unsound rye has a singular effect on the human body: viz. lassitude, weakness of the extremities, intoxication, and periodic convulsive movements. This state, which has been called raphania, or convulsiones cerealis, continues from a few days to several months.

It is stated by Dodard and other writers, that persons who used rye-bread containing a considerable quantity of the diseased grain were liable to a gangrenous affection of the extremities, attended with little fever, inflammation, or pain, though the affected limb became dead, and separated from the body. The limb became at first cold and insensible, and in the progress of the disease dry, hard, and withered. For a full account of this curious subject, the reader is referred to Dr. Thomson's work on inflammation.

Mortification may, when it is slight, terminate, 1. by resolution; 2. by adhesion; 3. by ulceration; 4. by sphacelus, or the death of the part, the last being by far the most frequent termination. (See MORTIFICATION.)

5. *Ulceration.*—When a solution of continuity follows as an immediate consequence of inflammation, the morbid process by which it is effected is called *ulceration*.

Previous to the time of Hunter, ulceration was supposed to be produced by the corrosive power of the fluids of the part in which the diseased action occurred. This celebrated pathologist, however, demonstrated satisfactorily that the solution of continuity was not affected by the acrimonious quality of the fluids, but by the action of the absorbents, the removal of parts or tissues by these vessels constituting the ulcerative process. He designated the formation of an ulcer by simple loss of substance, *ulcerative absorption*; and when the solid parts covering abscesses, aneurisms, and deep-seated tumours, in their progress towards the surface, were gradually removed by ulceration, he applied the term *progressive* absorption.

Dr. Thomson has proposed to distinguish the separation of dead or mortified parts by the term *disjunctive* absorption; but this appears to be an unnecessary refinement of medical terminology. Ulceration may occur as a consequence of every degree or kind of inflammation, not only in soft parts, such as skin, mucous membrane, brain, lung, liver, &c., but also in the texture of bone, in which structure the ulcerative process is termed *caries*. Indeed, we find that all textures of the body are susceptible of ulceration. "We see this exemplified," Mr. Lawrence observes, "when mortification has attacked an entire limb, and when the separation takes place by a natural process. Suppose, for instance, that the foot and lower part of the leg were mortified, and that the mortification stop in the middle of the leg, we find that the skin, the cellular membrane, the fascia, the muscles and tendons, blood-vessels, nerves, and even the bone itself, are all penetrated by the process of ulceration." (Lectures on Inflammation.)

Another familiar illustration of the progress of ulceration is observed in the progressive absorption which takes place in an internal aneurismal tumour, in which we find the sac of the aneurismal adhering to the parts with which it comes in contact, but after forming an intimate bond of union, the mass is gradually though slowly removed by the process of absorption; even the bone which intervenes between the external surface and the aneurism being finally absorbed.

It is this removal, Dr. Thomson remarks, of one texture after another, first the sac of the aneurism, then the pleura costalis, then muscles, bones, cellular substance, and cutis, layer after layer, that Mr. Hunter wishes to express by the term progressive absorption—a term sufficiently expressive of the general phenomena which it exhibits, and of the gradual and successive disappearance of the parts which cover abscesses, aneurisms, and tumours, in their constant and uniform progress to the skin. In this process the adhesive inflammation precedes the outward progress of the aneurism, and limits, as in phlegmon, the extent of the swelling, and, as it were, directs it to the surface of the body. (Lectures on Inflammation.)

The occurrence of ulceration is much more frequent in some textures than in others, depending on the degree of vascularity of the part which it affects. It is observed also to be a more frequent effect of chronic than of acute inflammation. The skin appears, of all other tissues, to be most susceptible of ulceration. Mucous membranes, cellular tissue, bones, and articular cartilages, come next in order. Fascia, ligamentous structure, and tendons, are the least liable to ulceration. Hence, as Dr. Thomson states, when abscesses form under ligamentous or fibrous fasciæ, we find that they are long in getting to the surface, and that they seldom arrive at this by the shortest and most direct road, but usually by passing through some texture or organ that is more susceptible of being absorbed.

It is important to remark, however, that inflammation of the same tissue, apparently the same in kind, degree, and duration, will terminate at one time in ulceration, and at another pass off without producing solution of continuity. The importance, therefore, of ascertaining those circumstances which influence the termination of inflammation in ulceration must be obvious.

6. *Induration.*—This effect of inflammation is frequently observed. When it follows acute inflammation, it depends on the presence of fluid effused into the tissue of the inflamed part, when it takes place as an effect of chronic inflammation, it is more frequently produced by the presence of various solid products to which the process gives rise. Induration is most generally observed in soft spongy cellular organs, as the brain, cellular membrane, lungs, &c., but more frequently in the two latter tissues, in which the induration subsequent to inflammation is often very considerable, and produces remarkable alteration in their structure.

7. *Softening.*—An opposite state, that of softening, is not an uncommon effect of acute inflammation. Although it is observed to take place in all tissues, it most frequently occurs in the substance of the brain, mucous membranes, and cellular tissue. As this subject is one of great practical importance, and has of late been very fully investigated, it will be fully considered under the article SOFTENING.

8. *Hemorrhage.*—Inflammation is often followed by hemorrhage. The effusion of blood may take place from almost every tissue and organ in the body, but more frequently from those parts which are covered with mucous membranes. The various circumstances under which hemorrhagic effusions, as a consequence of inflammation, take place, will be found under the article HEMORRHAGE.

Treatment.—From the serious and often fatal effects of inflammation, it is of the greatest importance to endeavour to subdue the symptoms on their first appearance, that those terminations or effects we have been considering, some of which have a dangerous and often fatal tendency, may be prevented. The necessity for the adoption of prompt measures is more especially necessary, when the inflammation is seated in an organ essential to life, in which the changes of structure frequently go on with great rapidity, so as either permanently to injure the function of the part, or to destroy life. Thus, when inflammation attacks the brain, lungs, heart, or intestines, or when it occurs in parts the organization of which is so delicate that the inflammatory action speedily destroys the structure and functions, as, for example, the retina or iris, the ear, or the larynx, the most energetic treatment should be adopted on its very first appearance. Another reason for the immediate employment of suitable measures in inflammation even in parts which are less essential to life, is, that when the blood-vessels become unduly distended for any length of time, they contract with difficulty, and thus give a greater susceptibility to recurrence of the inflammatory action, or, in other words, a predisposition to relapse.

Before commencing the treatment of inflammation, if any obvious exciting cause exist, it is proper to endeavour to remove it, and also to avoid every circumstance which can tend to keep up local or general excitement.

The object to be kept in view in the treatment of inflammation, is to effect resolution. This is, in some instances, the natural and spontaneous solution of the disease, though in the majority of instances it is induced by measures which tend to subdue the local and constitutional excitement. It is necessary, in estimating the probability of accomplishing such a desirable termination, to consider the duration of the inflammation, since we can only hope to bring about resolution in the more early stages. Even although the measures employed prove inadequate to this end from the duration of the symptoms before their application, still the severity or extent of the termination which may have ensued may be materially lessened by the judicious employment of means calculated to subdue inflammatory action.

The remedies by which the symptoms of inflammation are removed, have been termed antiphlogistic treatment, that is, remedies against inflammation. We have seen that the capillaries or vessels, which in the natural state admit only the colourless part of the blood, become so enlarged during inflammation as to admit red blood, and from their being thus surcharged, are inadequate to carry on the circulation. We have also seen that with this local congestion the vascular system throughout the body sympathizes, giving rise to symptomatic fever, during which the blood, being impelled with unnatural force, increases the distension and obstruction in the capillary circulation. These circumstances at once show the necessity of bloodletting, as the principal means of removing inflammatory diseases.

In all cases of active inflammation, but more especially when the constitutional symptoms are severe, general bleeding is to be employed, with the object of diminishing the quantity of blood, and, at the same time, of abating the force and frequency of the action of the heart and arteries. The abstraction of blood from the system is more especially necessary in inflammation of important organs, as of the brain, pulmonary and abdominal viscera, in which diseases it forms the principal means of cure.

It is generally found that inflammation of serous membranes requires larger losses of blood than when the parenchyma or substance of an organ is inflamed, and that, on the other hand, inflammation of mucous surfaces is less under the control of general bleeding; in such cases the local is preferable to the general abstraction of blood.

The propriety or necessity for general bloodletting being determined, the question as to quantity requires consideration. For this there cannot obviously be any fixed or determinate rule, as it must depend on the importance of the organ inflamed, the intensity of the inflammation, its duration, and the peculiar circumstances which each case presents. When an organ important to life is inflamed, and if there be no special circumstances to forbid copious bloodletting, the effect produced on the symptoms is a matter of greater moment than the quantity of blood abstracted.

The too common practice of prescribing a certain number of ounces of blood to be drawn from a vein in an acute disorder is most reprehensible. The disease may yield to the abstraction of a few ounces of blood, or a much larger quantity than was at first anticipated may be necessary. Hence the obvious advantage of the physician superintending the bloodletting he prescribes, in all cases of emergency. Every practitioner must have seen cases in which, though he had imagined a moderate bleeding (sixteen to twenty ounces) would have cut short the disease, a very considerable quantity of blood has been lost before an impression was made on the symptoms. In one case of pericarditis which lately fell under our observation, in which, after the disease had been nearly subdued, a recurrence of the symptoms took place with redoubled violence, according to usual custom twenty ounces of blood were ordered to be drawn from the arm. From the urgency of the symptoms, however, we superintended the operation. No relief of the pain was obtained after twenty, thirty, forty, and fifty ounces were abstracted. When sixty had been taken away, the patient exclaimed, "I now feel relieved." This large bleeding was necessary as a means of relief from most acute suffering. Besides the quantity abstracted, the rapidity with which the blood flows has an important influence on the symptoms. The blood should be drawn from a large orifice, that a decided impression may be at once made on the disease; for which purpose, in cases of inflammation of a vital organ, a vein in both arms may be opened, and the blood allowed to flow till there is an approach to syncope, which may be favoured by placing the patient in the erect posture, whereby the flow of blood to the heart and upper parts of the body is retarded. It is incredible the quantity of blood which some patients have lost before inflammation of an internal organ has been subdued. The late Dr. Gregory used to relate in his lectures the case of a young woman who lost two hundred and thirty ounces of blood in the space of a few days, before an attack of pleurisy was overcome. Such large bleedings, however, are seldom necessary.

The effect of bloodletting, more especially if carried to approaching syncope, in lessening inflammation, may be observed by comparing the state of the conjunctiva in acute ophthalmia, before and after the patient has been freely bled. The distended and tortuous vessels are no longer visible, and for some time after the conjunctiva often remains as pale as in its natural state. The same effect is produced on internal organs, and those structures which are not visible.

It is seldom that a single bleeding is sufficient to subdue active inflammation, even when carried to a sufficient extent. The disease may for a time appear subdued, but when the system rallies, when reaction succeeds to the depression consequent on a profuse bleeding, the symptoms reappear sometimes with the same intensity as at first, but more generally in a mitigated form, and require a repetition of the bleeding. We have sometimes seen the abstraction of a few ounces of blood, when the pulse was beginning to rise, indicating the period of reaction, give a final blow to the disease. Hence, in active inflammation, we are disposed to recommend, an hour or two after the first bleeding, the bandage to be re-applied, and a small quantity of blood (eight or ten ounces) to flow from the orifice. Even with this precaution the symptoms in many cases return, and therefore it is necessary to consider those circumstances which indicate the necessity of the further abstraction of blood, and the extent to which it should be carried.

1. There are some particular symptoms from which an indication as to the further loss of blood may be taken. We have observed that the effect of inflammation in an organ is to disturb seriously its functions; hence, when the natural function of an inflamed organ is restored, it is a true criterion of the cessation of the inflammation. When, however, the function of the part is only partially restored, or if, after being completely recovered, it again become disturbed, it is a sure proof that the inflammatory action is still lurking, and may, on the application of a trivial exciting cause, be again called into its former activity. Under such circumstances the further abstraction of blood will be necessary.

2. Another symptom requiring consideration as to the propriety of repeated bloodletting, is pain. In the early stage of inflammation it is more or less acute, but generally mitigated or removed by venesection; and when a moderate bleeding produces partial or complete cessation of pain, it proves that the inflammation has not made great progress. In other cases the relief from pain is less instantaneous or considerable, but takes place gradually with corresponding abatement of the other symptoms, and is often completely removed by local bleeding and counter-irritation. If, however, the pain be only partially mitigated, or its removal be of short duration, or after having been completely removed, it recur, announcing the renewal of inflammation, there can be no hesitation about the necessity of further depletion.

Again, we find that when acute passes into chronic inflammation, the pain abates, and ultimately entirely ceases, which may lead to the impression that the inflammation has been extinguished. Acute pain not unfrequently supervenes in such cases, and announces the conversion of chronic into acute inflammation, requiring a repetition of bloodletting and other measures for its reduction.

It is necessary, however, to remark that young practitioners are too often deceived in the expectation of acute pain in inflammatory diseases. We have already seen that when inflammation is allowed to proceed and to assume the chronic form, the pain abates, and at length finally ceases.

In many of the phlegmasiæ there is no pain, even when intense inflammation is going on. This is more especially the case in inflammation of the parenchyma of organs; in the brain, for example, in which most active diseases may be proceeding even to a fatal termination without any indication of pain. If, however, the symptoms be analyzed, abundant proofs will be given of the existence of serious inflammatory disease. Again, in pneumonia or inflammation of the pulmonary tissue, there is often no pain, the disease being indicated by cough or embarrassed respiration, and the crepitating sound of the breathing; or in cases of latent pneumonia, by the stethoscopic phenomena alone. Even in the advanced or chronic stage of inflammation of serous membranes, the pain abates or entirely subsides, while slow and insidious inflammation is going on. Were the practitioner to overlook such symptoms, and to imagine that in the absence of local pain inflammation did not exist, the life of his patient might be sacrificed.

3. The pulse has from the remotest antiquity furnished an indication of the propriety of bloodletting, and of the necessity for its repetition in acute diseases. In the phlegmasiæ the pulse is increased in frequency, and in volume or strength; and in inflammation of serous membranes it acquires more or less hardness, wiriness, or tension. The object of bloodletting is to reduce these states of the pulse, more especially the hardness, and in proportion as this is accomplished, the operation is beneficial; so that when we fail in removing this hardness of the pulse by profuse bleedings, the issue of the case is seldom doubtful. It is necessary, however, to bear in mind that in cases in which large losses of blood have been sustained, the reaction is often accompanied with a hemorrhagic throb or jerking of the pulse. We have often seen bloodletting prescribed for this state of the pulse, and observed that it invariably increased by the depletion; the crassamentum of the blood, at the same time, becoming progressively smaller at each bleeding. In these cases there is exhaustion with excessive reaction—a condition of the circulation which tends to impel the blood in inflamed parts, so that bloodletting proves indirectly a stimulating rather than an antiphlogistic measure when employed under such circumstances.

The state of the pulse alone, however, without reference to the general symptoms, is not always a safe criterion of the necessity for bloodletting. We find in many inflammatory diseases that the pulse does not exceed the average frequency or strength observed in health, so that were the practitioner to withhold his lancet solely because the pulse deviated little if at all from its natural state, a serious or often fatal error would be committed. In such cases the degree of pain or other local symptoms of inflammation must regulate the practice. We very lately found it necessary to abstract once and again a considerable quantity of blood from a patient with abdominal inflammation, whose pulse did not reach the ordinary average frequency. In this case it was discovered afterwards that the ordinary quickness of pulse did not exceed sixty. Again, in the early stages of inflammation of the brain, the pulse seldom exceeds the natural standard, or is often even slower than usual, though it is generally observed to rise after bloodletting. The state of the local symptoms, therefore, is always a more safe criterion of the propriety of adopting active measures in inflammatory diseases than either the pulse or the general symptoms.

4. The appearance of the blood, when drawn, will frequently, in conjunction with other symptoms, afford assistance as to the propriety of further abstraction. We do not think that the buffy coat, which has been regarded as a test of the presence of inflammation, should much influence the decision, as we find it occasionally wanting in inflammatory diseases. When, however, the blood on cooling exhibits the buffy coat, more especially when it is tenacious, the crassamentum firm, the pulse wiry or corded, and the pain unsubdued, it may be confidently predicted that the flammation is not subdued, and therefore more blood may be safely and advantageously taken. In the advanced stages of inflammation in persons whose powers are feeble, or when blood has been repeatedly abstracted, though the blood still exhibits the buffy coat, it is soft, and the coagulum loose. It appears, indeed, from the experiments of Prevost and Dumas, that when blood has been repeatedly abstracted, the red particles are diminished in number; and were we to judge from the gradual diminution of the fibrine, it would seem that this principle is also lessened. This appearance of the blood shows that inflammation still exists, but that no advantage will be derived from further bloodletting.

5. A most important circumstance, which it is necessary to consider in the treatment of inflammation by bloodletting, is the period or duration of the disease. If the symptoms have been allowed to go on without any effort being made to subdue them, it is vain to expect the same results from the vigorous use of the lancet, as in the more early stage. Profuse bleeding has less influence on the local disease than on the general powers; so that when inflammatory disease has slowly but steadily increased in an enfeebled habit, while at the same time the insidious approach of the symptoms has been overlooked, the patient has a better chance from the judicious employment of modified antiphlogistic measures, of which a moderate bleeding may often form part.

6. It is almost unnecessary to state that the quantity of blood extracted in inflammation must, with other circumstances, have reference to the age of the individual. The diseases of infancy are generally of the inflammatory kind; but it is very difficult to open a vein in infants. In such cases one or two leeches may be applied to the back of the hand or foot, and the bleeding afterwards encouraged by warm fomentations, or immersing the limb in tepid water. In the older infant, the number of leeches must be increased according to age. In some instances the leeches may be applied to the neighbourhood of the inflamed organ; as by this mode of abstracting blood the local symptoms are not only more speedily arrested, but the general symptoms, with which every form of acute infantile disorder is almost invariably accompanied, are reduced.

In childhood, greater advantage is often derived from venesection than in infancy; indeed the active forms of disease at this period of life are too often overlooked, the practitioner being satisfied with the local detraction of blood, while the bolder measure of venesection is required. It is true that blood is less easily drawn from the veins of the arm in children, but there is ample resource in the jugular, from which any quantity may be taken by a little adroitness on the part of the surgeon.

The period of life when bloodletting is most required, and produces the most decided effects, is from manhood to middle age, when the powers are vigorous. After the middle age the powers decline, and the system is less able to contend with active disease, and the remedies necessary for its removal. While at the one period bloodletting may be carried fearlessly to the required extent, the practitioner must be more cautious when he is contending with acute disease at an advanced age.

7. Physicians often derive useful information from observing the prevailing type of diseases. In idiopathic fevers more especially, this knowledge is almost indispensable for the safe conduct of the case. The same observation is applicable to the treatment of inflammation, in which there is often a material difference in the intensity of activity of local and constitutional symptoms, as well as of the power of the system to bear large losses of blood. The most palpable illustration of this is the different types of fever which accompany puerperal or child-bed fever, which is well known to require different treatment according to the prevailing character of the epidemic.

7. Much has been said about the influence of temperament in determining the treatment of inflammatory diseases. The diseases of the sanguine temperament have been supposed to be of a more acute character, and to require a more active mode of treatment, than the melancholic or nervous. Greater weight, we apprehend, has been given to this notion than experience has warranted. Were the acute disorders of those of the melancholic temperament to be treated on this idea, serious errors would undoubtedly be often committed. The fact seems to be that persons of the sanguine temperament are more predisposed in general to acute or inflammatory diseases, and consequently are more frequently the subjects of them than those of the melancholic, bilious, or nervous; but when inflammation has once taken place, there is less difference as to its intensity, from the constitution or temperament of the individual, than has been usually imagined.

[Recent researches into the constitution of the blood in various diseases have led M. Andral to infer, (*Hématologie Pathologique*, p. 123, Paris, 1843, or Amer. edit. by Drs. J. F. Meigs and A. Stillé, Philad. 1844.) that when once the blood has commenced producing an excess of fibrin, a certain time is required before this disposition is exhausted; or in other words, the process, he thinks, is self-limited. Still, he is of opinion, that at the earliest period, when the solid is merely congested, and the fibrin of the blood is scarcely above its healthy proportion, the advancement of the disease may be arrested by bloodletting, and in certain cases it may be cut short.

The arrest of the blood in the veins of the extremities, *hæmostasis*, has been employed by Professor Nathan R. Smith, and by Dr. T. H. Buckler of Baltimore, (*Maryland Medical and Surgical Journal*, March, 1843,) as a sedative agent to relieve inflammatory engorgement in parenchymatous organs, or inflammations of membranous tissues; to remove hyperæmia, and to restore the balance of the circulation; as well as to prevent hemorrhage resulting from either rupture of vessels, transudation of blood, or from wounds inflicted upon blood-vessels. If a bandage be applied around a limb sufficiently tight to arrest the venous circulation completely, and at the same time allow the arteries to pulsate, the blood within the distended veins is cut off, as it were, from the general circulation; a depletory effect is, in this manner, induced; and if the arrest of the venous circulation be practised on all the extremities at once, the skin becomes relaxed; the force of the action of the heart and arteries is weakened; and if the ligatures be applied when the heart and arteries have been deprived of a portion of the ordinary amount of blood, owing either to anæmia or to bleeding, so that the vessels are partially empty, it is found, according to Dr. Buckler, that the exhalants of the skin pour out the most copious perspiration; that the patient complains of a light feeling about the head, of weakness, and sickness of stomach; and if the carotids be pressed upon, they are discovered to be scarcely pulsating, and all the phenomena of syncope are found to take place.

Possessed of such powers, hæmostasis may be found a valuable agent in the treatment of the phlegmasiæ more especially; and it has been urged upon the notice of the profession by Dr. Buckler. "Hæmostasis," he thus forcibly expresses himself, "accomplishes what no other known remedy is capable of doing. It puts syncope under our control, both as to duration and degree. It is capable of exerting, under given conditions, a more powerful control over the circulation than the lancet, antimony, or digitalis; and controls the heart's action without exhausting the vital forces, or giving rise to the ill consequences which the protracted use of most of the sedative agents is likely to do. And, finally, hæmostasis, in the hands of judicious practitioners, must prove the means of saving an incalculable amount of blood,—to say nothing of the incredible benefits which would be derived from its adoption by those Sangrados of our art, who bleed empirically in all conditions, and who, in many cases, like the fabled vampire, suck the living current until the vital powers are spent."]

We have been considering hitherto those cases of inflammation in the treatment of which general bloodletting is required. It is not, however, always necessary to take blood from the system, the topical abstraction being often sufficient to accomplish the cure. Cases also frequently occur in which the loss of even a small quantity of blood from the system is followed by considerable inconvenience and exhaustion, though the same amount of blood abstracted locally is followed by excellent effects.

This mode of bloodletting may, therefore, be employed 1, when the amount of inflammation is trivial; 2, when the powers of the patient are too weak to admit of general bloodletting; 3, when the active stage of inflammation has been allowed to pass over, and is therefore little under the control of general bloodletting; 4, as an auxiliary to general bloodletting, when further loss of blood from the system is deemed unnecessary. Moreover the local abstraction of blood may be often so managed as to secure the advantage of a general bleeding. Thus, when blood is taken from the temporal artery or from the jugular vein in diseases of the brain, the quantity may be so regulated as to obtain this double advantage: hence the preference given to this mode of bloodletting in acute diseases of the brain.

With regard to the mode of abstracting blood locally, cupping is preferable to leeching in all cases in which it can be employed.

The blood is more rapidly abstracted, and the quantity more nicely regulated. There are regions of the body, however, to which cupping-glasses cannot be applied; under such circumstances recourse must be had to leeches in suitable numbers.

Another powerful antiphlogistic measure in the treatment of inflammation is the exhibition of purgative medicines, which not only remove accumulated secretions, but, according to the class of purgatives employed, produce, by their action on the intestinal exhalants, a powerful derivation from the circulating system. Hence great advantage is derived from a combination of cathartics, which may be administered in suitable doses and at longer or shorter intervals, according to the indication to be fulfilled.

By active purging the general powers may be very much lowered; so much so, indeed, that mild cases of inflammation often yield to the exhibition of purgatives alone, though the more sure and efficacious practice is to employ at the same time other antiphlogistic measures, more especially bloodletting, general or local, according to circumstances.

There is another principle on which the beneficial operation of cathartics may be explained, viz. that of revulsion. When a powerful medicine of this class is exhibited, a copious secretion from the surface of the alimentary canal takes place: the sudden removal of so much fluid from every part of the system not only lessens the quantity of liquids in the diseased as well as the healthy parts of the body, but in the general determination to the bowels, the irritation has been supposed to be diverted from the local inflammation to the intestines. We apprehend, however, that the benefit derived from free purging in inflammation is more owing to the abstraction of fluid, than to the revulsion which may be induced.

The employment of purgatives is more applicable to some forms of inflammation than to others. The circulation in the brain is readily affected by purgatives, as is evident from the paleness of the countenance, and the syncope induced by active cathartics. Hence in all cases of cerebral congestion and inflammation, purging ought never (unless under special circumstances) to be omitted. In threatenings of relapse, the exhibition of purgatives often supersedes the necessity for local or general bloodletting; and from the intimate sympathy which exists between the intestines and brain, the necessity of attending to the proper regulation of the bowels in the stage of convalescence from acute diseases of this organ must be apparent.

In thoracic inflammation, purgatives form part of the antiphlogistic treatment. Experience, however, shows us that they are less efficacious in this than in some other forms of inflammatory disease; and, therefore, when there is evidence of pulmonary inflammation, more reliance is to be placed on the general and topical abstraction of blood than on the exhibition of purgatives; and when there is gastro-intestinal complication, they are to be rigidly withheld.

Since the morbid states of the alimentary canal have been so thoroughly investigated, practitioners are more guarded in the exhibition of purgatives in the treatment of abdominal inflammation. It is necessary to sweep out the bowels once or twice by some active aperient in the commencement, except when the mucous membrane is the seat of inflammation. It is a great source of anxiety with many practitioners to procure the free action of the bowels in peritonitis, which led the late Dr. Saunders to remark, in his lectures on peritonitis, that the best mode of opening the bowels is by the lancet; a practical precept in which we perfectly agree, as there can be no question of the mischievous effects arising from irritating the bowels by cathartics at a time when it is most important that every source of disturbance be averted.

When the peritoneal inflammation is subdued, the bowels are readily opened by comparatively mild aperients: indeed, this soluble state of the bowels is a tolerably sure criterion of the subsidence of the peritonitis. Much harm is also often done by injudiciously irritating the bowels after the inflammatory symptoms have disappeared; and we have many times traced the recurrence of enteritis to the constant irritation of the bowels by purgatives administered with the object of simply effecting their evacuation, which may be at all times ensured by emollient glysters, or a small quantity of castor-oil.

If it be necessary to be cautious in the employment of purgatives in peritonitis, it is more particularly so in inflammation of the mucous membrane of the intestines, which is not only a very common primary disease, especially in children, but a frequent complication of other acute disorders. It is unnecessary, however, to do more than to allude to this subject in this place, as it has been already fully and ably discussed. (See Enteritis and Gastro-Enteritis.)

Mercury is a remedy of considerable power in arresting inflammation, either in conjunction with bloodletting, or in cases in which the loss of blood is deemed inexpedient. The beneficial effect of this medicine is best exemplified in the treatment of iritis, in which disease its power of controlling inflammation and in preventing the effusion of lymph, or, when effused, of effecting its absorption, are quite perceptible. Another illustration of the powers of mercury in checking the progress of inflammation is observed in inflammation of the larynx and trachea, in which organs, from their delicacy of structure, serious consequences often arise when the inflammation is not speedily arrested.

There can be little question that it exerts a similar influence over inflammation of internal parts, and appears to have a peculiar power in arresting or controlling the action of the capillaries, and of preventing those changes from taking place which are so destructive to the organization of inflamed tissues. In other instances, when the inflammation has assumed a chronic form, and consequently is little if at all under the influence of any form of bloodletting, mercury may be employed with the most decided advantage. The quantity in which it is administered must depend on the violence of the inflammation and the organ that is affected. It is in some cases necessary to bring the system more rapidly under its influence than in others; for instance, in inflammation of the iris, the larynx, or of the trachea. Therefore, after general or local bleeding, two grains of calomel, or five of the hydrargyum cum cretâ may be given every alternate hour till there be some decided amendment in the symptoms. In diseases of less urgency, the same quantity may be given at more distant intervals, every four, six, or eight hours, according to circumstances. When the mercury produces purging, it must be combined with opium; or, if opium be improper, some of the ordinary astringents—catechu, kino, or chalk may be employed. Some physicians recommend much larger doses of mercury—ten, fifteen, or even twenty grains of calomel at once, and do not hesitate to repeat these enormous doses at short intervals. We confess we have never seen any case of inflammation which, if curable at all, resisted the more moderate doses we have advised. In the inflammatory diseases of hot climates, which run their course with frightful speed, the rapid introduction of mercury after venesection seems to be the only chance of saving life. In the acute diseases of temperate climates, however, most practitioners prefer the smaller doses, repeated at longer or shorter intervals according to circumstances.

Though mercury is capable of arresting the progress of inflammation when exhibited alone, it is often more successful when combined with opium. This is more especially necessary when there is much suffering from pain.

As a general principle, opium is inadmissible in inflammation, until the excitement has been reduced. That it is a stimulant has been proved by most carefully-conducted experiments on the lower animals, as well as by observation of its effects on the human body both in health and disease.

We have just adverted to the exhibition of calomel and opium in the treatment of inflammation. The notice of the profession was, many years ago (1783), first directed to the efficacy of this combination in the treatment of inflammatory diseases by Dr. Robert Hamilton, of Lyme Regis. He acknowledged that the practice was first suggested from the favourable accounts he had received from a navy surgeon of the treatment of hepatitis by mercury. He adopted the hint, and found the practice successful in the hepatic inflammation which frequently accompanies the bilious, intermittent, and remittent fevers of this country. He soon, however, found it necessary to add opium to relieve pain, which happily most effectually answered that purpose. The success of this mode of treating hepatitis induced Dr. Hamilton to conclude, that it would prove equally so in every form of internal inflammation. He first prescribed calomel and opium in peripneumony, and was successful in a large proportion of cases, and under a variety of circumstances. The cases of pleuritis, enteritis, and child-bed fever, in which it was employed, also speedily vanished.

The efficacy of this combination in arresting internal inflammation led to its employment in acute rheumatism and in gout; and Dr. Hamilton had the satisfaction of seeing these diseases also give way most readily under its use. The following is a summary of Dr. Hamilton's mode of prescribing it. After bleeding and evacuating the bowels, a pill containing from five to one grain of calomel and from one to a quarter of a grain of opium according to the age and powers of the patient, was directed to be administered every six, eight, or twelve hours, according as the intensity of the inflammation and aspect of the disease required,—plentiful dilution with barley-water or any weak tepid beverage being at the same time enjoined. When there was much fever, with dry parched skin, tartar-emetic and sometimes camphor were added; this combination had the effect of determining powerfully to the skin, and promoting the action of the kidneys and bowels. After three or four pills taken in the course of twenty-four hours, the symptoms were evidently relieved; in other twenty-four, the disease gave way and soon terminated. If, however, there was no abatement of the inflammatory symptoms in the first twenty-four hours, more blood was abstracted, the calomel and opium given more frequently, and continued till the force of the disease was subdued.

It was remarked that when the mercury induced much sweating and purging, the salivary glands did not become soon affected; but it was not uncommon to observe the patient greatly relieved, though the mercury did not affect the mouth, or produce any visible evacuation, except a slight increase of urine or insensible perspiration.

The mercurial plan was almost invariably successful when employed early in the disease; but when adopted in the later stages, its efficacy was more uncertain, though when the mercurial action could be induced on the salivary organs, the recovery was more sure. Counter-irritation was at the same time adopted when necessary.

With regard to the allegation that, as the calomel had been combined with other powerful medicines, the beneficial effects might with greater probability be ascribed to them than to the mercury, Dr. Hamilton states, that though he always regarded the opium as of the most essential service in relieving pain, and that the tartar-emetic and camphor have sometimes contributed to the cure, he had often seen cases in which tartar-emetic, camphor, and opium had been for some days employed without affording the smallest relief; but on the addition of calomel, the symptoms gave way in a very short time; the amendment seemed in many cases, indeed, to take place as the salivary glands became affected. (Duncan's Medical Commentaries, vol. ix.) Subsequent experience has amply confirmed the practical deductions of Dr. Hamilton as to the efficacy of calomel and opium in the treatment of inflammatory diseases. This combination forms an admirable auxiliary to the use of the lancet in internal inflammation; and when the period for bloodletting has passed over, gives the patient the best chance of recovery.

Neither this nor any other remedy, however, must be permitted to interfere with bloodletting in active inflammation. Mercury may assist in controlling inflammation and render less bleeding necessary, but is in itself inadequate to subdue it. It is, in the first place, necessary to break the force of the disease by venesection, and afterwards to exhibit mercury, care being taken not to push this remedy too far, as it has been observed that its specific effects take place very readily when large quantities of blood have been abstracted.

When the inflammation has passed into the chronic stage, which precedes alteration of structure, mercury is the best, often the only mode of removing it.

Many physicians consider that in active inflammation the administration of opium alone, after a full bleeding, is followed by the most happy effects, especially in irritable habits. We have often in our practice, as well as in that of others, witnessed its efficacy. After bleeding the patient to approaching syncope, having regard to the effect rather than to the quantity abstracted, the reaction which generally follows a large bleeding may often be prevented by two grains of solid opium, or a draught containing one grain of pure acetate or muriate of morphia, administered when the faintness is disappearing. The heart's action is thus controlled, while the nervous system is tranquillized; so that the patient enjoys an interval of refreshing sleep, from which he often awakes with a soft skin and freedom from pain. In many cases this practice, with a moderate cathartic, is sufficient to arrest the inflammatory disease. If, however, after an interval of three or four hours, the symptoms return, with hot skin and wiry pulse, the bloodletting must be repeated, and two grains of opium with three or four of calomel given as before. It may in these instances be advisable to administer afterwards a few doses of this combination in smaller quantities—two grains of calomel with half a grain of opium at intervals of three or four hours.

This practice has been strongly recommended by the late Dr. Armstrong who emphatically said of Dr. Hamilton's treatment, that "it deserves to be written in letters of gold, on account of its great practical utility." In a paper written by this physician in the Transactions of the Associated Apothecaries, entitled "On the Utility of Opium in certain Inflammatory Disorders," he recommends the more early and free use of opium, evidently considering that the great advantage arises from the administration of the opium alone. He advises, after bleeding to approaching syncope, three grains at least of good opium, to be given in the form of a soft pill; and that strict quietude be enjoined, in order if possible to procure sleep. In some instances, Dr. Armstrong found a smaller quantity of solid opium sufficient; but the dose was made equal by a portion of laudanum, which in highly irritable habits is preferable, because the sedative influence of the opium is thus more speedily procured. On some occasions, where a great quantity of blood has been lost in irritable persons, a large dose has been given after venesection, never however beyond five grains of solid opium, nor a drachm of the tincture at once.

The effects of opium thus administered, according to Dr. Armstrong, are to prevent a subsequent increase in the force or frequency of the heart's action, and a recurrence of pain, while it induces a tendency to quiet sleep and copious general perspiration.

Dr. Stokes has recently brought this subject before the profession in an excellent practical paper* in the first volume of the Dublin Medical Journal, written chiefly with the view of pointing out the advantage to be derived from the administration of opium in peritonitis, occurring under circumstances where bloodletting cannot be employed. The cases alluded to are—1. peritonitis arising from the escape of fœcal matters into the peritoneal cavity, through a perforating ulcer of the intestine; 2. peritonitis arising from the bursting of an abscess into the serous cavity, or from rupture of the intestine, induced by external violence; 3. peritonitis occurring after the operation of paracentesis in delicate subjects; 4. low typhoid peritonitis occurring after delivery.

In these cases of peritonitis, the rapid sinking of the vital powers renders bloodletting and the usual treatment in common peritonitis inadmissible; the indications are to support the strength of the patient as far as circumstances permit, and afterwards to endeavour to prevent the further effusion in the peritoneal cavity, by inducing organization and adhesions of the effused lymph. For this latter purpose, Dr. Stokes thinks opium in large doses pre-eminently calculated. This practice was first suggested from the successful treatment, by liberal doses of opium, of two cases of peritonitis after tapping, and of another from the effusion of purulent matter into the cavity of the belly. Dr. Stokes gives several cases in illustration of this plan of treatment. In the first he was unsuccessful, which he ascribes to the exhibition of purgatives, from his mind being warped by an early and unfounded prejudice as to the necessity of evacuations from the bowels. In another, after a moderate leeching, a grain of solid opium was given every hour without inducing the slightest affection of the brain, though the patient took, in the course of eight days, one hundred and five grains of opium, exclusive of opiate injections, administered with the object of checking a severe diarrhœa which set in for three or four days.

Dr. Stokes has subsequently treated cases of common peritonitis with opium, where bleeding was inadmissible, and has had no reason to change his high opinion of its powers; and further proposes it as a remedy in cases of rupture of the bladder and uterus, in peritonitis after paracentesis, or succeeding to the operation for strangulated hernia, and in pneumo-thorax from pulmonary fistula.

The favourable results of the treatment of inflammation of the serous membranes by opium, has led Dr. Stokes to employ it in the same condition of the mucous membrane, and under similar depressing circumstances. In a very interesting case of severe gastric fever, in which the abdominal symptoms ultimately became alarming, from the supervention of severe diarrhœa, which every day threatened death from exhaustion, a grain of opium was ordered every hour, when the patient seemed in articulo mortis: this was continued for the first twelve hours without inconvenience, but with the effect of procuring refreshing sleep. Next day the remedy was repeated in the same dose every second hour; and from this time the improvement was rapid, and ended in final recovery.

Liberal doses of opium seem also to have had an excellent effect in a case of phagedenic ulceration of the throat. We have seen the most astonishing results from large doses of opium in sloughing phagedenic ulceration, occurring in connection with syphilitic symptoms in broken-up constitutions, such as is frequently observed in the lowest order of prostitutes.

Dr. Stokes has drawn the following conclusions on this subject: — 1. that in cases of recent inflammation of serous and mucous membranes, where depletion by bloodletting or other antiphlogistic measures is inadmissible, and the system in a state of collapse, the exhibition of opium has a powerful effect in controlling the disease; 2. that under these circumstances the remedy may be given in very large doses, with great benefit and safety; 3. that its effect, then, is to raise the powers of life and remove the local disease; 4. that the poisonous effects of opium are rarely observed in these cases; the collapse and debility of the patient appearing to cause a *tolerance* of the remedy.

Acute pain may sometimes render the exhibition of opium necessary, even in the acute stage of inflammation. When the pain is so excessively violent as to constitute the most prominent symptom of the disease, and has resisted full depletion and other active remedies, its continuance tends greatly to aggravate the inflammatory action, and may even induce a fatal prostration of the vital powers. Under these circumstances, the subjugation of the pain becomes the most pressing indication, and this is to be effectually accomplished by the administration of opium in doses of from one to two and even three grains. This plan of treatment has proved eminently beneficial in severe cases of peritonitis, of sciatica and acute rheumatism affecting the heart. In those cases attended with extreme pain, two grains of opium may be given at first, and one grain every hour until the pain has subsided. It is necessary that the dose should be increased in proportion to the violence of the pain, and that the remedy be cautiously continued, until it has made a decided impression upon the nervous system, in order to procure the relief intended. It is well known that very large doses of opium are well tolerated when the nervous system is much excited: but to guard against any injurious effect of this remedy on the brain, a cold lotion may be applied to the forehead, or if necessary to the whole scalp.

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* Clinical Observations on the Exhibition of Opium in large doses in certain cases of disease, by William Stokes, M D. one of the Physicians to the Meath Hospital.

There is another condition of the system in which opium is extremely beneficial, viz. in exhaustion from loss of blood. There are some individuals who do not bear bloodletting well even when it is necessary; in other cases, blood may be abstracted under mistaken views of the nature of the disease, or it may happen that more blood has been taken away than the symptoms either warranted or required.

In those cases of exhaustion arising from the effects of loss of blood, opium, with nourishment and cordials, is the best plan of restoring the patient.

There are some inflammatory diseases in which opium cannot with advantage be prescribed. In inflammation of the brain, it is a doubtful remedy even after the more active symptoms have been reduced. Indeed, in all acute diseases in which the brain is primarily or secondarily affected, the exhibition of opium requires great circumspection. It not unfrequently happens that when the more urgent symptoms of cerebritis have been overcome, the patient continues restless and wakeful, with a cool skin, soft clean tongue, and rapid soft pulse. These symptoms are often decidedly ameliorated by a full dose of opium. In inflammation of the mucous membranes, which generally terminates by an increased secretion, opium, from its tendency to check this salutary process, should be withheld, unless special circumstances arise to render its exhibition imperative.

Of the other remedies of this class, our individual experience does not warrant us to say much in terms of praise.

Digitalis, which was formerly so much extolled for its anti-inflammatory powers, is now rapidly falling into disuse. Though it certainly exerts a peculiar effect on the heart's action, its uncertainty and the length of time which elapses before it produces any decided impression, have tended much to impair the confidence which was at one time reposed in its efficacy in controlling inflammation. We have seen it given in very large doses (ten drops every half hour), and though it lowered the frequency of the circulation, it seemed in many instances to exert scarcely any control over the local disease. From what we have personally observed, therefore, we should not feel inclined to recommend the employment of digitalis as an anti-inflammatory remedy.

Colchicum is certainly efficacious in checking gouty and rheumatic inflammation. Some years ago this remedy was much used as a contro-stimulant in visceral inflammation, and was by some imagined to be little inferior in power to bloodletting. These sanguine expectations, however, have not been realized, and at present the administration of colchicum is almost entirely confined to the specific inflammation of gout and rheumatism, in which cases, we have prescribed a pill containing the acetic extract of colchicum (gr. i.) and extract of hyoscyamus (gr. iii.) every eight hours, with excellent effects.

Among the remedies resorted to with the view of resolving inflammation, antimony has always been held in high estimation. Since its first introduction by Paracelsus, antimony has enjoyed more varied reputation in the treatment of acute diseases than any medicine in the Materia Medica. After it had been declared a most valuable remedy in many formidable disorders, it was denounced as a poisonous medicine, and interdicted under very severe penalties by the French Parliament in 1566. In later times, however, it has been again brought into use, and within the last century has been prescribed as a most powerful antidote to almost every form of febrile disease. Various forms and preparations of this mineral have been from time to time introduced, but after repeated trials of their efficacy only two have been retained. These are the antimonial powder, pulvis antimonialis of the London Pharmacopœia, and the tartrate of antimony and potassa. The virtue of the antimonial powder is not only doubtful, but according to the experience of some physicians it appears to be positively inert, 130 grains having been given by Dr. Elliotson three times a-day without producing even nausea. Dr. Thomson has satisfied himself from experimental investigations that the composition of the antimonial powder, and that of James's powder, which the former was intended to imitate, are totally dissimilar. This excellent pharmaceutical chemist states as the reason, that the antimony in James's powder is in the form of a soluble *protoxide*, while that in the pulvis antimonialis of the Pharmacopœia is in the state of an insoluble *peroxide;* and from the ascertained fact that the more soluble the salts of antimony are, the more certain and powerful is their effect on the living body, the cause of the inertness of the one, and the more certain efficiency of the other, is thus explained.

Sometimes the skin becomes moistened, or the bowels gently purged by small doses (two or three grains) of James's powder given every four or six hours. More generally, however, it does not produce any sensible evacuation, the pulse becoming softer, and the skin more cool under its use. It is more efficacious when combined with calomel or blue pill, or occasionally with opium, when there is pain. Thus, after general or local bleeding, a pill containing two grains of calomel or blue pill, the same quantity of James's powder, and a quarter or half a grain of opium, may be given every three or four hours with decidedly good effects, every alternate pill being followed by a saline aperient, should the state of the bowels require it.

The tartrate of antimony and potassa (tartar-emetic) is the preparation in most general use. It is seldom exhibited as an emetic, as the action of vomiting in inflammatory diseases is deemed prejudicial, at all events until the general excitement is reduced by bloodletting.

Stohl, however, recommended emetics in pneumonia. We are also told by Laennec, that Riviere vomited his patients in pneumonia with tartar-emetic daily, or every second day; and that Dumangin, physician to La Charité, followed this plan, and though he seldom combined bloodletting with it, that his practice was quite as successful as that of Corvisart, who bled much in that disease. Laennec concludes, that in these cases, the good effects of the tartar-emetic are to be ascribed to the derivation exerted on the intestinal canal.

This mode of treatment still prevails in many parts of the continent, especially in France, as appears from memoirs which have recently emanated from the French press.*

From the well known effects of continued nausea in depressing the heart's action, nauseating doses of tartar-emetic are frequently administered in inflammation, in conjunction with other antiphlogistic measures. For this purpose, a quarter of a grain of tartar emetic may be given in solution every two or three hours. The first two or three doses generally produce vomiting, but afterwards constant sickness is the only effect observed. By this mode of administration, the sub-acute forms of inflammation are often resolved, and in feeble habits, when the disease is little under the control of general or local bleeding, this mode of administering antimony is often followed by the most beneficial effects. The more slow or insidious forms of pulmonary inflammation, or the progress of tubercular disease may also often be checked by administering antimony in nauseating doses.

In still more minute quantities, (one-sixth or one-eighth of a grain every three hours,) tartar-emetic acts as a diaphoretic. This mode of administering antimony in inflammatory diseases was extolled by Cullen, and his example was followed by his pupils. It is seldom, however, prescribed alone, but in combination with other remedies of this class, more generally the saline diaphoretics.

Antimony has been at times exhibited in very large doses as an anti-inflammatory remedy, more particularly in Italy; indeed the large doses in which it has been administered by some continental physicians so astonished British physicians, that the accounts inserted in the foreign journals were at first discredited by many, while others supposed that there was a material difference in the chemical composition of the tartar-emetic. It has, however, been proved by chemical analysis that there is no essential difference between the Italian and British preparations, besides that the formula given in the respective pharmacopœias is nearly alike.

The practice of giving large doses of tartar-emetic was revived in Italy by Rasori, who, after embracing and widely disseminating the doctrines of Brown, had an opportunity of witnessing their fallacy in the treatment of an epidemic fever, which broke out at Genoa in the years 1799 and 1800. The application of the Brunonian principles to the management of this epidemic was attended with such fatal results, as to induce Rasori to change entirely his mode of treatment, and to substitute antiphlogistic measures. The practice of *contro-stimulus* which was pursued consisted in bloodletting, followed by large doses of tartar-emetic, four, six, eight, or more grains being given in the course of the day in any agreeable vehicle. The success of this treatment was as great as the previous plan had been fatal, and had an important influence in subverting the untenable theories of Brown in the north of Italy. It also induced Rasori to employ the tartar-emetic in other acute diseases, more particularly in peripneumony. From the memoir which he published on this subject, (the translation of which afterwards appeared in the Archives Gén. de Méd. for 1824,) it appears that after one or more bleedings, or without this evacuation, according to circumstances, he prescribed twelve grains of tartar-emetic at intervals daily, which was repeated during the night. If the disease had made considerable progress, he began with twenty or thirty grains, increasing the dose daily till one or even several drachms were taken in the course of twenty-four hours. The result of this practice in the hands of Rasori was encouraging. Of eight hundren and thirty-two cases of pneumonia treated by the tartar-emetic, one hundred and seventy-three only died. It was subsequently prescribed by most of the Italian physicians, some of whom published the results, from which it appears to have been even more successful in their hands.

Laennec was induced from these flattering accounts to make a trial of it, but at first restricted it to cases of apoplexy. Having occasion some time afterwards, however, to attend two cases of peripneumony in which he thought it inexpedient to resort to venesection, he determined to make trial of the tartar-emetic; both patients rapidly and unexpectedly recovered, so that he was encouraged to give it in other cases. Laennec did not prescribe it in the large doses recommended by Rasori; indeed his mode of administration is so judicious that it has been generally adopted. The following is a summary of the manner in which Laennec employed the tartar-emetic in the treatment of pneumonia. As soon as the existence of the disease was recognised, and the patient was able to bear venesection, blood was first taken from the arm, unless in cachectic or debilitated subjects, in which it was deemed advisable to dispense with this evacuation. Immediately after bleeding, one grain of tartar-emetic dissolved in infusion of orange-leaf was directed to be taken and repeated every second hour for six times, after which the patient was allowed to remain quiet for seven or eight hours, if the symptoms were not urgent, or the patient disposed to sleep. If the inflammation had already made considerable progress, the same dose was continued uninteruptedly until there was decided amendment.

It was seldom necessary to give a large quantity of the tartar-emetic, though in extreme cases as much as a grain and a half, two grains, or two grains and a half, were prescribed at the same intervals. Many patients were found to bear these doses of the tartar-emetic without either vomiting or purging being induced: more generally, however, it excited vomiting or purging for the first day, but this effect soon passed off, and the *tolerance* (power of bearing the remedy) became established often within twenty-four hours from the time of its first administration. It was even occasionally necessary afterwards to prescribe gentle aperients to keep the bowels open. It was observed also that the tartar-emetic was most efficacious when it did not produce any sensible evacuation; and that, although severe vomiting and purging are by no means desirable, the cure of the inflammation was often very satisfactory, when the stomach and bowels were much irritated by the remedy. This may often be checked by combining with the tartar-emetic a small quantity of opium. Laennec recommends the addition of one or two ounces of syrup of poppy to the six doses to be taken in twenty-four hours. We have found the irritation very much allayed by adding the dose of the tartar-emetic to the common effervescing mixture, to which a few drops of laudanum may, if necessary, be added.

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* Mémoire sur les fluxions de poitrine, par Louis Valentin, M. D. Clinique Méd. de l'Hôtel Dieu de Rouen.

At the end of a few hours, seldom beyond twenty-four, such a decided improvement in the symptoms takes place, that both the patient and the practitioner are encouraged to persevere with the medicine till resolution of the inflammation be effected, when the medicine should be withdrawn gradually by giving it at more distant intervals. It is singular how patients become accustomed to tartar-emetic, when restored to convalescence. Laennec states that when they are taking their usual allowance of food, nine, twelve, or even eighteen grains of the emetic tartar may be taken daily without their being at all aware of any medicine being given. This is in opposition to the opinion of Rasori, who considers the *tolerance* to be owing to the excess of stimulus which exists in the system and produces the disease; consequently, whenever this is destroyed by the contro-stimulant effect of the tartar-emetic, the tolerance, were this theory correct, should cease, which is certainly in direct opposition to our own experience. We have observed in some cases of pneumonia treated by tartar-emetic, that when the patient could bear a grain every second hour, twenty drops of the antimonial solution produced copious vomiting, showing that this medicine is less emetic in large than in small doses.

Laennec has detailed shortly the several diseases in which the emetic tartar has been found successful in his hands. These were, 1. pulmonary inflammation; 2. inflammation of serous membranes, though he did not appear to place great value on its powers in this class of diseases; 3. hydrocephalus; 4. phlebitis; 5. acute chorea; 6. articular rheumatism; 7. severe ophthalmia; 8. apoplexy; 9. acute dropsy.

No satisfactory explanation has been offered of the mode in which tartar-emetic affects the resolution of inflammation. It appears not only to check the progress of inflammation, but to cause the absorption of inflammatory effusions. Laennec affirmed that he had observed, in a case of articular rheumatism, well marked fluctuation of the knee-joint disappear in the course of six hours by the use of this medicine.

The value of large doses of tartar-emetic, as a powerful anti-inflammatory remedy, is now established by the united experience of some of the most distinguished British and continental practitioners. In our hands, we have seen the most surprising effects produced by it when administered according to the mode proposed by Laennec. We have never found it necessary to exceed twenty grains in twenty-four hours, and when the remedy is at all likely to be beneficial, this quantity need not be exceeded. There are few cases of inflammatory disease in the early stage, which do not yield to prompt bleeding, followed by a few doses of tartar-emetic; and in cases which have been so long neglected that the period of bloodletting has been allowed to pass over, it affords the best chance of grappling successfully with the disease.

These are the general measures on which our chief reliance should be placed for the removal of inflammation. There are other points of minor importance to be attended to; for example, the thirst is to be allayed by cooling sub-acid drinks, containing lemon-juice, cream of tartar, or a solution of the pulp of tamarinds. It is also sometimes expedient to endeavour to diminish feverish heat by the free admission of cool air, by light bed-clothes, and by administering refrigerants, such as citrate of potash, acetate of ammonia, or nitre. These measures, however, are not to divert the attention from the more active remedies.

The propriety also of removing every source of irritation is obvious; not only is the exciting cause to be ascertained, and, if practicable, removed, but excitement of every kind must be withdrawn; hence in visceral inflammation the greatest quietude of body and mind is indispensable. When, therefore, the inflammation is seated in an external part, all use of the organ must be avoided, and such position adopted, as will be least likely to favour the circulation of the blood towards the inflamed part.

Every kind of food which has a tendency to excite the circulation must be avoided; the very mildest farinaceous aliment being best adapted, and even this should be given in small quantities at stated intervals.

We shall next shortly allude to the local treatment of inflammation.

In all diseases attended with excitement, the free application of cold is decidedly beneficial. In inflammation of the brain, after depletion, the application of cold evaporating lotions, or bladders filled with pounded ice, not only reduces the morbid heat of the scalp, but diminishes the vascular action in the brain. The most powerful mode of applying cold to the head is the *cold dash*, which we regard as little inferior to bloodletting itself; and when the general powers are too weak to render the abstraction of blood to an adequate extent expedient, it is the most effectual mode of arresting the inflammatory action.

In the subacute or chronic form of inflammation of the lung, more particularly in that slow insidious form which attends the formation or progress of tubercles, the local application of cold tends materially to check the progress of tubercular disease. For this purpose the chest is to be sponged daily with vinegar and water, (at first tepid, and afterwards cooled down to the natural temperature,) and after being rapidly dried, the skin should be well rubbed with a coarse towel or flannel. This mode of applying cold has also the advantage of removing or diminishing the susceptibility to cold, which renders the consumptive invalid so liable to returns of the inflammation. In inflammation of the abdomen, cold applications have been recommended by some practitioners. Some years ago Dr. Sutton strongly advocated this practice in peritoneal inflammation, and detailed several interesting cases in which the local application of cold was decidedly beneficial. From Dr. Sutton's observations, this practice appears to be peculiarly adapted to the chronic stage of peritonitis, when the symptoms are not such as to require bloodletting. (Tracts on Delirium Tremens, on Peritonitis, &c. by Thomas Sutton, M. D. 1813.)

In external inflammation, the application of cold lotions forms an essential part of the antiphlogistic measures. For this purpose a solution of acetate of lead, or a lotion consisting of equal parts of the acetate of ammonia, alcohol, and water, may be employed. These may be used cold or tepid, according to the feelings of the patient.

Warm applications are often very beneficial in inflammation. The warm bath, by producing a powerful determination of blood to the external parts, is often employed with great advantage, more especially in inflammation of the abdominal cavity. For this purpose the temperature of the water should not be too high, (not exceeding 98°,) a greater degree of heat proving a stimulus, and thus increasing the inflammatory action.

The partial application of heat in the form of fomentations is often a powerful mode of reducing inflammatory action, and at the same time of relieving pain. We have an illustration of this in the beneficial effects of the vapour arising from warm water, or the decoction of poppy or hyoscyamus in ophthalmia, and in various forms of external inflammation. Warm fomentations properly applied often prove valuable applications also in internal inflammation. We have often observed excellent effects from them in pulmonary inflammation after general or topical bleeding, and in abdominal inflammation this practice is so beneficial that it is seldom if ever omitted.

The different forms of counter-irritation are employed in certain stages of inflammation with great advantage, after the activity of the symptoms has been subdued. When this has been accomplished, should there be pain, the application of a sinapism or blister to the neighbourhood of the inflamed organ will frequently remove it, and when the inflammation has passed into the chronic form, the repeated application of blisters is decidedly beneficial. Great care, however, should be taken that local stimulants be not applied until the active stage of the disease has been overcome. The principles on which the application of counter-irritants should be employed have been so fully discussed in the articles COUNTER-IRRITATION and DERIVATION, that it is unnecessary in this place to go more into detail. We may, however, just advert to the practice of applying blisters when inflammation has receded from a part it had just occupied, and fixed on another organ, as happens now and then in gout and rheumatism. It has been recommended to apply a blister near the seat of the former disease with the view of recalling the inflammation, but we agree with Mr. Lawrence, that it is better to attack the inflammation vigorously in its new quarters, than to attempt to entice it back to its old seat.

It is scarcely necessary to state, that in determining the measures which may be necessary for the treatment of inflammation, we must bear in view the particular circumstances with which it is accompanied, or which may arise in its progress. For example, we are to consider not only its duration, and degree or amount, but the age and constitutional powers of the individual, and the effect of such measures as may have been adopted. When inflammation occurs in a feeble or exhausted habit, (and the local symptoms may in such cases be intense,) the treatment must be less active. Perhaps a small bleeding may be hazarded, but in general it will be more safe to trust to local bloodletting, with mercury and opium. It is often necessary in such cases to adopt local antiphlogistic treatment, and at the same time to give general support by animal nourishment. Even wine may be occasionally required.

There is another point of great practical importance connected with the treatment of inflammation. We frequently observe, after the employment of active measures, that the symptoms though much modified, continue; the general symptoms may even be entirely removed, but the local disease is still perceptible; a degree of passive inflammation or local congestion remains, which a further extension of bleeding or purging infallibly aggravates. This is often observed in ophthalmia, and did not escape the observation of Hunter. In other instances the measures adopted produce exhaustion accompanied with morbid irritability, which it is often exceedingly difficult to distinguish from inflammation. Both the local and general symptoms will, however, afford some assistance. The pulse, though quick, will be found soft and compressible, the skin cool, and there is little if any thirst. The local symptoms are slight; there is often very little pain, and when there is, it is transient. What is to be done under these circumstances? Stimuli may reproduce the inflammation; bleeding and other depleting measures will aggravate the symptoms. It is most prudent in these cases to try cautiously fluid nourishment, with a little wine in sago or arrow-root; and if the state of the local symptoms admit of local detraction of blood, a few leeches may be from time to time applied. In short, a combination of treatment answers best.

In the treatment of congestions of blood — a subject of great importance, though involved in obscurity—we agree with the precepts laid down by Dr. Barlow. If the congestion arise in a plethoric habit, it is evident that general antiphlogistic measures, more especially bleeding, purging, and abstemious diet must be resorted to. This plan, however, must not be carried too far; it is sufficient to take off the pressure from the circulation in order to overcome the plethora. Over-bleeding, from the reaction which follows, and the weakness it induces, brings on this very state.

When the local congestion is unaccompanied with general fulness, or when it is the result of irritation, local depletion is to be adopted in preference to the general measures, which are indispensable when plethora exists: indeed, as Dr. Barlow has well remarked, general depletion is not only unnecessary but injurious, enfeebling the system, and weakening those efforts by which the congestion would be naturally relieved. (See CONGESTION OF BLOOD.)

The other measures which in congestive affections may be employed in conjunction with bloodletting, or alone when this evacuation may be dispensed with, are mild purgatives, diaphoretics, warm bathing, counter-irritation, and low diet. These several measures must be varied, and repeated more or less frequently according to circumstances.

Congestive affections, both of an acute and chronic character, are not unfrequently combined with general debility; and there are cases in which a mixed plan of treatment is often indicated, and the management of which requires generally much tact and caution. The general debility is sometimes the *primary* cause of the acuteness and persistence of the congestion; and if such active antiphlogistic remedies be used as increase the general debility, they will inevitably have the effect of aggravating the local complaint. While, therefore, it may be advisable, in such cases, to keep the local congestion in check by small topical bleedings, counter-irritation, fomentations, poultices, &c. it is often necessary to strengthen the constitution by the use of tonics, generous diet, and change of air.

In many cases of chronic congestions in which the blood-vessels are relaxed, the resolution of the congestion is often greatly favoured by the exhibition of tonics and stimulants. We may mention, for instance, the good effects of various tonics in chronic catarrhal affections, and in some other chronic pulmonary diseases.

In cases of habitual determination of blood, and of a tendency to attacks of congestion of one particular organ, such as the brain, lungs, &c. bleeding by revulsion (or at a remote distance from the organ affected) occasionally repeated, together with great attention to the regulation of diet, and the general management of the system, is found more effectual than depletion in the neighbourhood of the organ, which often induces an increased disposition to an undue influx of blood, although it may procure momentary relief.

Chronic inflammation differs from acute only in degree. The duration of the disease is of little consequence compared with its intensity. It should also be kept in mind that inflammation which has been for some time in a dormant or chronic state, sometimes becomes suddenly acute, and may require vigorous measures for its removal.

In the treatment of chronic inflammation, there being no constitutional excitement, general bloodletting is seldom necessary, local bleeding by cupping or the application of leeches being generally sufficient, unless there be a degree of feverishness, or the inflammation be seated in an organ over which local bloodletting exerts little control, when the abstraction of a few ounces of blood from the arm is preferable. The bowels are to be thoroughly cleansed by purgatives, and afterwards a general action should be kept up by alterative doses of mercurials with the milder kinds of aperients, such as rhubarb with manna and Rochelle salt.

Counter-irritation is especially necessary in chronic inflammation. Blisters are less effective than the more severe kinds of counter-irritants, such as tartar-emetic ointment, or a plaster made of equal parts of Burgundy pitch and yellow wax, to which a scruple or a half-drachm of tartar-emetic (according to the size) is to be added. Either the tartar-emetic ointment or plaster brings out a copious eruption of pustules, which greatly relieves the chronic forms of inflammation. Sometimes a seton, caustic, issue, or the moxa, is employed with great advantage.

In all cases of inflammation, whether acute or chronic, the regulation of the diet is of essential importance. In acute inflammation the mildest food only is admissible; in the chronic, nourishment may be more freely allowed. Indeed it is often necessary to allow moderate support while local bleeding and other measures are employed. Pure air is of most essential consequence in all acute diseases, and often exerts a most decided influence in the treatment of low kinds of inflammation, which it is often difficult to remove in certain localities.

The general principles by which the treatment of inflammation is to be regulated having been considered, we proceed to state what is necessary to be done when any of its effects or terminations have taken place.

It is necessary, however, to bear in mind, that although the inflammation may have produced either of the morbid changes alluded to, the inflammatory action may be still going on, so that it is necessary to watch the primary disease, as well as its effects. For example, in pleurisy and peritonitis, the liquid effusion in the pleural or abdominal cavity does not necessarily imply that the inflammation of the pleura or peritoneum has ceased: on the contrary, we almost invariably find it necessary in such instances to combat the inflammation on which the effusion depends, at the same time that we attempt the removal of the effused fluid. It is not uncommon to observe, that as the local inflammation is reduced, the effusion disappears simultaneously, or very soon after: in such cases the effusion does not depend, as has been too generally supposed, on diminished action of the absorbents, but on the increased quantity of fluid which is effused from the inflamed surface.

The sudden relief which often follows from bloodletting judiciously employed in cases of acute dropsy is thus explained; and also, how venesection frequently removes dropsical effusion when diuretics in every form and combination have failed. When effusion follows inflammation of a more chronic character, more especially when the powers of the individual are low, it becomes a point for consideration how far any form of bloodletting may be advantageously adopted. In such cases the local abstraction of blood, or other local antiphlogistic measures, may be advantageously combined with such remedies as are calculated to effect the removal of the effused fluid. The various means which are to be employed, as well as the circumstances which are to regulate their administration, have been already considered in the article **Dropsy**, to which we refer.

The effusion which takes place as a consequence of inflammation of any of the three cavities may proceed to such an extent as to embarrass seriously the functions of the contained organs, and even ultimately to destroy life. This has led to an attempt to evacuate the effused fluid by an opening. Such an operation, however, is not always practicable, as, for instance, in the effusion which is the effect of acute hydrocephalic inflammation. A few practitioners of more than ordinary boldness have, however, ventured on tapping the cranium in *chronic* hydrocephalus; but though in some recent examples this operation has been successfully performed, we fear the small average proportion of cases in which it has succeeded will scarcely give general encouragement to hazard it.

When effusion to a considerable amount takes place in the pleural cavity, there is little hope of deriving any permanent advantage from the employment of internal remedies administered with the view of promoting the absorption of the effused fluid. In such cases the chest has been tapped, and with such favourable results that this operation can no longer be viewed as a hazardous attempt, but the only means of saving the sufferer from indescribable suffering and ultimate death. (See EMPYEMA.)

When peritonitis terminates in effusion, the effect of evacuating the fluid is doubtful: in many instances the fluctuation is not perceptible during life; and even were the fluid detected, more benefit is derived from occasional leeching, counter-irritation of the abdomen, mercury, and diuretics. By a steady perseverance in these measures, abdominal effusion succeeding to peritonitis has been frequently removed under most unpromising circumstances.

When inflammation has terminated in suppuration, similar principles must regulate the treatment, the extent of purulent formations being often materially diminished by a continuance of measures calculated to abate the inflammatory action. The kind and extent of these measures must depend on the active or passive nature of the local as well as constitutional symptoms, the object in every case being if possible to arrest, or if this be impracticable, to diminish the extent of the purulent formation, and afterwards to promote either the absorption or evacuation of the matter. If the suppurative process be accompanied by local or general symptoms, as in *phlegmonous abscess*, it is evident that a persistence in antiphlogistic measures, including general or local bloodletting if necessary, may be required till the excitement is subdued. It is well known also, that a removal of the inflammatory action frequently takes place in an organ after matter has formed, just as acute may supervene on chronic inflammation, or as the inflammatory process may be suddenly renewed in a part recently inflamed. The necessity, therefore, of watching the progress of inflammation in organs in which purulent formations have occurred, is apparent, though the attention of practitioners, it must be confessed, is too often almost exclusively directed by the local measures which are best calculated to assist the evacuation of the purulent matter.

On the other hand, when suppuration takes place in feeble habits, general antiphlogistic measures must be employed with great caution, even though there be evidence of local excitement. In these cases, a moderately stimulant plan of treatment, consisting chiefly in nutritious diet, a moderate use of wine and tonic medicines, is often more successful; and should the local affection indicate too great excitement, this may be moderated by small detractions of blood from the neighbourhood of the part, and such other local measures of an antiphlogistic kind as circumstances may require. In short, the practitioner must have in view, on the one hand, not to retard a salutary process, nor, on the other, to increase or renew the action by which the suppuration has been induced.

When suppuration succeeds to phlegmonous inflammation of the external parts of the body, various topical applications are found useful. Warm applications are most suitable not only from their soothing, but from their supposed power of promoting the process of suppuration. Fomentations of simple warm water, or of decoctions of anodyne or emollient substances, are to be frequently applied, and the part afterwards covered with a large poultice of bread and water, or of linseed flour, some contrivance being adopted to prevent the escape of the heat and moisture. These applications are to be frequently renewed, as soon, indeed, as they become cool, the principal benefit being derived from their warmth and moisture.

When fluctuation can be detected, whether the purulent matter be collected in a distinct cyst or abscess, or be diffused in the cellular tissue, it becomes a subject of consideration whether the pus should be evacuated by an opening made into the part, or be allowed to discharge itself by the gradual process of ulcerative absorption or spontaneous rupture.

If the abscess be situated near the surface of the body and at a distance from any important organs, surgical interference may generally be dispensed with. There are some circumstances, however, which render it advisable to open abscesses as soon as matter can be detected. For example, when the abscess forms in the neighbourhood of an organ important to life, such as the larynx or trachea; near a large joint; in the vicinity of any of the great cavities; when the matter is deep-seated, or being resisted by an unyielding texture, becomes diffused among other parts where less resistance is offered, as in abscess beneath the fascia covering muscles, in the sheaths of tendons, or under the periosteal covering of flat bones—an early opening should be made for the discharge of the purulent matter. The cavity of the abscess becomes afterwards gradually obliterated by the process of granulation and cicatrization, but this stage of the curative process frequently requires the attention of the surgeon.

The treatment of chronic suppuration differs in many respects from that of the acute. It is often surprising how little constitutional disturbance precedes or accompanies these chronic abscesses, which have sometimes been observed to give no indication of their formation, till attention has been directed to an indolent swelling, which on examination is found to contain fluid. They are frequently observed in individuals of an unhealthy constitution, and more especially in those of a strumous diathesis. Hence, in the treatment, the improvement of the general health must form a more prominent feature than even the local management of the abscess.

Chronic abscesses evince a great disposition to increase in size, but the matter has a tendency rather to become diffused than to approach the surface, or, as it is termed, *to point*. The propriety, therefore, of opening them requires, in general, little consideration, though the mode in which this is to be done is a matter of greater nicety. Mr. Lawrence, in his lectures on inflammation, has very clearly pointed out the local and constitutional effects which follow when these chronic abscesses are opened in the same way as a phlegmonous abscess. If an aperture be made so as to evacuate the matter, and a poultice be afterwards applied, as is the practice in phlegmonous abscesses, the entrance of the air produces decomposition of the matter; the surface or cyst of the abscess inflames; the purulent secretion is altered, becoming thin, fetid, and very irritating to the parts with which it comes in contact. The constitutional disturbance which is thus excited aggravates the local disease, which, in its turn, reacts on the constitutional irritation to such a degree as seriously to disturb the general health, and frequently to destroy the patient.

The mode of treating chronic abscesses adopted by the late Mr. Abernethy obviates the risk of inflammation of the cyst, and the constitutional effects to which it gives rise. This consists in making a small oblique opening into the abscess so as to allow its contents to escape, the ingress of air being carefully prevented; the aperture is then to be closed, and pressure applied so as to allow of its uniting by adhesion. The object of this practice is to diminish the cavity of the abscess, so that, after it has become contracted, it may be again opened, and afterwards treated in the same way as a phlegmonous abscess, and at the same time to obviate the constitutional irritation which arises from exposing the cyst of a large abscess to the action of the external air.

This mode of treatment is, however, not invariably successful; the cyst often continues to secrete pus so as to distend the abscess to its former size, or, if it be diminished, a fistulous opening leading to a large cavity remains. In these cases, surgeons have succeeded in producing inflammation and adhesion of the cyst of the abscess by passing a seton through it, or by injecting irritating fluids.

The general health is to be improved by nutritious diet, vegetable or mineral tonics, and residence in a pure atmosphere.

The treatment of ulceration must depend on its local or constitutional origin, the acute or chronic character of the inflammation by which it is accompanied, the causes by which it is induced, and the structure in which it occurs.

1. Ulceration may be strictly a local affection, as when it arises on an external part of the body from an external cause, such as a wound or other kind of injury. In this case the ulceration may be either accompanied with little or no inflammatory action, or with considerable local as well as constitutional disturbance. It is evident that in the former, mild local applications, and avoiding exercise or use of the part, will speedily effect a cure; while in the latter, antiphlogistic measures,, even general or local bleeding, must be combined with topical applications.

2. When ulceration arises from constitutional causes, in addition to the local treatment it is necessary to attend to the general health. Thus, when ulceration of an external structure arises from syphilitic, syphiloid, cancerous, scorbutic, or scrofulous diathesis, it is in vain to attempt to heal the ulceration by local measures alone; or should these succeed, the cure cannot be considered permanent until the particular constitutional malady be subdued.

3. Though almost every tissue of the body is liable to ulceration, it occurs more frequently in the skin and mucous membranes. In the former the treatment is often tedious, depending in many instances on the state of health and previous habits of the individual. The local treatment requires attention also to the kind and extent of the local inflammation: this is in some cases of an active inflammatory character; in others it is of a low or chronic kind, the one demanding an antiphlogistic, the other a stimulant plan of treatment. It is inconsistent with this outline to enter more minutely on the treatment of ulcers, and as this belongs more properly to the province of surgery, we beg to refer to the writings of Home, Lawrence, Thomson, Cooper, Bell, Brodie, and others, for much valuable information on this subject.

Ulceration in mucous membranes is more common in some situations than in others, the gastro-intestinal mucous membrane being by far its most frequent seat. We have repeatedly alluded to the latency of gastro-enteritis, and even when it proceeds to ulceration, the symptoms are no less equivocal. Hence arises the uncertainty of any method of treatment except that which tends to arrest inflammation in this tissue. We do not affirm that ulceration of mucous membranes does not cicatrize: this has been demonstrated by the most satisfactory process, not only in genuine cicatrix of ulcers of the stomach and colon, but even in the small intestines. The exhibition of mineral tonics and astringents—sulphate of copper, or the superacetate of lead, in combination with opium — in intestinal ulceration have been found successful, though some physicians speak of the more powerful vegetable tonics, sulphate of quinine, strong infusion of catechu or logwood, as equally efficacious.

When ulceration occurs in the bucco-pharyngeal membrane from the syphilitic or syphiloid poison, the treatment must be entirely constitutional; therefore mercury, sarsaparilla, and nitric acid must be given according to circumstances. Phagedenic ulceration of the genital organs requires the application of a powerful escharotic, for example, the concentrated nitric acid. We have seen the action of this *specific* in those cases powerfully assisted by liberal doses of opium, to the extent even of a scruple in the twenty-four hours.

Mortification is a frequent termination of inflammation, but it arises also from a variety of other causes. It is obvious, however, that in this place we can only consider the treatment of that form which is the effect of inflammation, and refer for information as to the measures to be adopted, when it takes place from other causes, to various articles in this work, and to the article MORTIFICATION.

The general principles on which the treatment of mortification originating in inflammation is to be conducted, vary according to the circumstances with which it may be associated; for it is inconsistent to suppose that one general rule can be applicable to every case that may occur. Dr. Thomson has justly remarked, there can be no general plan of treatment equally suitable to the differences which occur in the seat, form, progress, and state of the disease, nor to the various affections of the general system by which it is invariably accompanied.

In all cases of mortification there are some circumstances to be considered before any plan of treatment is determined. 1. Mortification, in respect to its seat, is distinguished as it affects an internal or an external part. 2. It is necessary to determine whether the mortification arise spontaneously, (i. e. from some causes connected with the general system, which are not very obvious,) or whether it originate from some external cause or local injury; and, 3, whether it be of an acute or chronic character.

When inflammation of an external organ terminates in mortification, it is almost invariably fatal, the acute inflammation of which it is the effect being often of itself sufficient to destroy life; when it is not, the system is seldom able to withstand the additional irritation which the mortification induces. If, therefore, the violence of inflammation in an internal organ be likely to terminate in gangrene, the only indication of treatment is to prevent its taking place by active antiphlogistic measures, since it is well known that death almost invariably follows mortification of an internal organ, unless, as very rarely happens, the gangrenous inflammation has stopped spontaneously, and the mortified parts have separated and been afterwards expelled by a natural outlet.

In every disease it is obviously necessary to ascertain and to remove, if possible, its causes; and this is no less important in mortification. When it arises from inflammation, it is necessary to discover whether this action still continues, or has abated or entirely ceased. If the inflammation still continues, it is proper to ascertain its degree, both as respects the general as well as the local symptoms; for we often find that there is considerable local action going on, with very moderate excitement of the constitution. When the causes and degree of gangrenous inflammation have been ascertained, the object of the treatment to be adopted is to prevent mortification taking place; or if it have already occurred, to arrest its progress; and if seated externally, to promote the separation of the mortified from the living parts.

To fulfil these indications, the measures to be adopted must have reference to the acute or typhoid character of the symptoms. It is scarcely necessary in the present day to state that no reliance can be placed in the antiseptic medicines recommended by the older authors, on the mistaken idea that mortification depended on putrefaction or decomposition of the solids. Their principles of treatment consisted in endeavouring to prevent or arrest mortification by administering, internally and externally, medicines which were known to prevent the decomposition of dead animal matter. These were chiefly the more powerful vegetable and mineral tonics, and various local stimulants, applied to the mortified parts. It is true that in certain states and stages of mortification the same measures are in the present day employed, but on very different principles, no one attributing their good effects to a supposed power of preventing putrefaction by their chemical operation, but to their action as general corroborants or stimulants. The practical error committed by those who ascribed the advantages which occasionally resulted from the exhibition of these remedies, was not only in the principles on which they were administered, but in their indiscriminate adoption in every stage and form of mortification, even in cases which originated with acute inflammation. We shall presently show that they have their value even among modern pathologists; and in stating our opinion, we wish to impress on the reader that we are desirous of guarding the inexperienced against erroneous principles of application, rather than against the remedies themselves.

In acute mortification, the general and local excitement require the adoption of antiphlogistic measures, modified according to circumstances. General bloodletting, if the pulse be full and hard, and there be great local pain and redness, will be necessary, and must be repeated till the pulse become soft, and the other symptoms are moderated. The other parts of the antiphlogistic treatment, consisting of purgatives, saline diaphoretics, and abstinence from stimulating food, must be at the same time enjoined. These measures are necessary in the early stage of acute inflammation, not only to prevent mortification, but, when it has begun, to check its further progress. The extent to which bloodletting and the other antiphlogistic measures are to be carried, requires nice discrimination, and especially reference to the age, powers, and previous habits of the individual, as well as to the stage of mortification. The pulse in these cases is often a fallacious guide, more especially when the mortification occurs in a vital organ. The practitioner must, therefore, consider rather its particular character with regard to fulness or hardness, than to frequency. If it be soft, though frequent, and if the skin be cool,—moreover, if the individual be of an irritable habit, and somewhat advanced in years, the lancet must be withheld, as under such circumstances detraction of blood would increase the irritability of the heart's action, weaken the patient, and favour the progress of the mortification. Such symptoms, which are often mistaken for inflammation, require attention to the state of the bowels, the moderate use of opium, the exhibition of mild nourishment, and the moderate use of wine. In other instances the state of the general as well as of the local symptoms indicates subacute inflammation — a condition intermediate between acute and chronic mortification, requiring a modification of the antiphlogistic treatment, according to existing circumstances. A full bleeding from the arm may be necessary or advisable, to diminish the velocity and force of the circulation, though, in many instances, this may be dispensed with; local bleeding, by the application of leeches at a short distance from the mortified part, purgatives, antimonials, mercury, and low diet, being generally sufficient to arrest the progress of the mortification.

When the treatment adopted has succeeded in abating the inflammation, and when the progress of the mortification is consequently arrested, further antiphlogistic measures must be suspended, and the powers of the patient reserved for what the system has yet to accomplish—the separation of the mortified from the living parts. In the external parts of the body this is indicated by a red line, which shows the boundary of mortification, and, at the same time, that the process has stopped.

A certain degree of inflammation is necessary to carry on the separation of the dead from the mortified parts; and if the powers of the system be feeble, it is evident that this salutary process cannot proceed. In this stage the patient must be supported, especially if advanced in years, by animal food, in the form of strong broths or jellies, and in some cases wine and other diffusible stimuli may be given, according to the indications. It is necessary to be very cautious, however, that these measures be not adopted too early, or before the inflammatory action be sufficiently reduced; and if they seem to renew the inflammatory excitement, they must be administered in small quantities, or altogether withdrawn, and mild vegetable nourishment substituted. A similar tonic plan of treatment is requisite when the general fever assumes a typhoid type, which it frequently does very early: in these cases the mortification often proceeds with great rapidity, and the only chance of arresting it is by the liberal administration of stimuli, animal nourishment, cordials, and wine.

From the supposed virtues of the Peruvian bark in preventing or arresting mortification, it is necessary to allude to it more particularly. About a century ago it had acquired considerable reputation for its supposed antiseptic powers, and was extolled as a remedy possessing great power in the treatment of mortification. It is probable, however, that its indiscriminate adoption led to frequent failures; it consequently fell into disrepute, and its exhibition is now confined entirely to mortification accompanied with typhoid symptoms, in which other remedies of a stimulant and tonic kind are found useful. It is obviously an improper remedy when there is inflammatory excitement, when there is derangement of the stomach and bowels, or when the mortification succeeds to inflammation, produced by external injury. When it is indicated, the sulphate of quinine is the best form of administration, in doses of two grains repeated at suitable intervals. When either the bark in powder, infusion, or decoction, or the sulphate of quinine disagrees, or proves too stimulating, an infusion of some of the lighter vegetable tonics, cascarilla, gentian, or calumbo, may be substituted; to an effusion of either of these an aperient, such as the infusion of rhubarb, may be added, should the state of the bowels require the combination.

Opium, when administered in proper cases, is an invaluable remedy in mortification; it soothes pain, and diminishes the restlessness and irritability with which mortification is so frequently accompanied, and often procures sleep. In the acute stage of mortification, it is improper until the excitement has been subdued; it may then be given at distant intervals in combination with calomel. One grain of opium combined with two of calomel in a soft pill may be given every six or eight hours, if there be pain, irritability, and wakefulness; and should this quantity fail to procure sleep, two grains of solid opium may be given once, or perhaps twice in the twenty-four hours. This remedy is more especially indicated should spasms or convulsions arise in the progress of the mortification. The late Mr. White, of Manchester, recommended, in spasmodic contractions and convulsions arising during mortification from external injury, large doses of musk and volatile alkali, which he asserted removed the singultus, subsultus tendinum, and convulsive spasms, while at the same time the mortification was stopped. We agree, however, with Dr. Thomson as to the doubtful efficacy of these remedies under the circumstances mentioned by Mr. White, more particularly as this eminent surgeon candidly confessed he had been disappointed in the effects of this combination, when it was tried in mortification arising from other causes.

When mortification on the surface of the body has terminated in sphacelus, the separation of the mortified from the living parts may sometimes be assisted by local applications. In former times, the practice of surgeons was to make incisions or scarifications through the dead down to the living parts, in order to apply stimulating, and, as was supposed, antiseptic substances, such as turpentines, balsams, and even essential oils, regardless of the degree of local inflammation which already existed or might be produced by such applications. Mr. Samuel Cooper has very well remarked, that though such things are indeed really useful in preserving dead animal substances from becoming putrid, a very little knowledge of the animal economy is requisite to make us understand that they cannot act in this manner on parts still endued with vitality; but on the contrary, that they must have highly prejudicial effects in the cases under consideration, by reason of the violent irritation which they always excite when applied to the living fibres.

Any local application is unnecessary, and often injurious before the mortification has stopped. This, as we have seen, is indicated by a defined red line, which shows the separation of the mortified from the living parts: the living portion adjoining the sphacelus assumes a red colour, ulcerative absorption commences, by which the mortified are gradually removed from the living parts.

The object of local applications is, 1. to soothe the local irritation: 2. to allay any excitement in the part that may arise; 3. to accelerate the process of separation when it proceeds too slowly; and, 4. to correct the fetor.

The most soothing application is a common poultice made of stale bread or linseed flour and water, and in nine cases in ten this forms the best local application in mortification. When the heat of a poultice produces too much irritation, a cold lotion, or if more agreeable to the feelings of the patient, a tepid lotion may be applied by means of one or two folds of linen. It should be remembered, however, that while heat increases the local action, cold, on the other hand, though it at first diminish or repress vascular action, when too long applied produces debility, and may be consequently injurious.

When it appears expedient to stimulate the living parts, several local applications are employed by surgeons. Mr. Lawrence recommends the nitric acid, of which from four to ten drops may be added to an ounce of distilled water, and lint moistened in this lotion applied to the part. The pyroligneous acid has also been applied with advantage, more especially in hospital gangrene. A liniment, composed of oil of turpentine and resinous ointment in equal proportions, is an excellent stimulating dressing in mortification. The mode of applying this liniment is to moisten lint in it when made warm by putting the vessel in which the liniment is contained in boiling water, by which it is soon liquefied. The lint soaked in this liniment is to be put on the part, which is to be afterwards covered with a large warm poultice. This dressing may be renewed once or twice a day or oftener, according to circumstances.

Various kinds of stimulating poultices have been recommended. The common yeast poultice, prepared by adding to the grounds of stale strong beer, as much bread crumb or lintseed flower as will make a poultice, answers very well: or some surgeons prefer the effervescing poultice, prepared by adding to an infusion of malt as much oatmeal as is necessary to form a poultice, and afterwards mixing with it a table-spoonful of fresh yeast.

When the ulceration looks healthy, and the process of separation goes on satisfactorily, the stimulating ingredients in the dressings must be diminished or wholly withdrawn. Dr. Thomson has shown that the ulcerating surface is, in the progress of separation, liable to pass, under every mode of treatment, into the state of a painful and irritable ulcer; and in this state it may require to be treated with anodyne fomentations, or with poultices made of carrot, turnip, or fresh hemlock leaves. In these cases, as in sores from other causes, the applications require to be frequently changed, which has often a most beneficial effect on the ulceration.

With the view of correcting the fetor arising during the process of separation of mortified parts, charcoal has been employed. The common charcoal poultice is made by adding to a common bread and water or lintseed poultice, two ounces of finely levigated charcoal: this application generally destroys the fetor arising from the mortified parts.

The disinfecting agents which have been lately introduced—the chloride of lime, or of soda—when applied in proper strength to a gangrenous sore, remove very effectually the unpleasant smell, and may, therefore, be employed in conjunction with the other local measures. We distrust, however, the accounts given by the French writers of their power in arresting the progress of mortification; in our opinion, they are useful only in correcting the fetor, and cleansing a foul sore.

When an extremity has become mortified, it is necessary to remove it to save the patient's life. The general rule adopted by surgeons is, to defer amputation until there is decided evidence that the mortification has stopped; but for information on this important point, we beg to refer to the writings of those surgeons who have discussed the point of practice.

It is necessary to advert to the treatment of mortification arising from unequal pressure on those parts on which the body rests, when an individual has been long confined to bed. The parts which are most liable to mortification from this cause are thinly covered with flesh, viz., the sacrum, hips, scapulæ, elbows, and sometimes the cartilage of the ears, and the skin covering the cranium. It takes place more especially in diseases attended with debility, as in the advanced stage of continued fever, in the typhoid forms of which there appears to be a tendency to gangrenous inflammation; it occurs also in bad compound fractures, in cases of tedious suppuration, and in paralysis; it is much favoured also when the evacuations are passed involuntarily.

According to Dr. Thomson there are two forms of disease arising from pressure, which are not always accurately distinguished; the one is mortification; the other a chafed, excoriated, and ulcerated state of the same parts; the mortified state, however, being always an indication of a greater degree of weakness. They not unfrequently occur in the same diseased surface, a part in which a mortified slough or eschar has been formed, passing very readily into ulceration, so that a sore, which at first was small, often acquires in this way a very large size.

The treatment depends on the circumstances with which each case is accompanied. When mortification occurs from pressure in the low or typhoid forms of fever, the strength must, as a general rule, be supported, unless special symptoms arise to render the tonic plan inexpedient. It is important, however, to discriminate the irritative fever which the mortification frequently induces, after the primary febrile symptoms have nearly or entirely disappeared.

When ulcerative or gangrenous inflammation arises in diseases in which the system is less disposed to mortification from failure of the vital powers, as in paralysis, bad compound fractures, and long-continued suppurations, there is less necessity for stimulants; mild nourishment, great attention to cleanliness, and suitable local applications, with attention to relieving the unequal pressure, forming the best plan of treatment.

For the purpose of obviating the unequal pressure sustained by those parts on which the body rests, various contrivances have been invented. A soft down pillow, or an air-cushion, may afford temporary relief. The bed invented by Mr. Earle is well adapted for many surgical diseases which require for their cure long confinement in one posture. The frequent failures of these various contrivances, however, led our scientific friend Dr. Arnott to construct a *hydrostatic* or *floating* bed for invalids, on the following ingenious principle —that the support of water to a floating body is so uniformly diffused, that every thousandth of an inch of the inferior surface has, as it were, its own separate liquid, so that no one part bears the load of its neighbour; that a person resting in a bath is nearly thus supported; and that, though the pressure of the atmosphere on our bodies is fifteen pounds per square inch of its surface, yet because it is uniformly diffused, it is not felt. He also reflected that the pressure of a water-bath of depth to cover the body is less than half a pound per inch, even on the under side, where it is greatest, and similarly unperceived; and therefore concluded, that if a patient were laid upon the surface of a bath, over which a large sheet of India-rubber cloth (which is quite impermeable to water,) is thrown, the body being rendered sufficiently buoyant by a mattress placed under it, the invalid would repose on the face of the water without sensible pressure on any part, and almost as if the weight of the body were annihilated.

A bed constructed on this principle and made in the following manner has been found to effect this desirable object. A trough of convenient dimensions (six feet long, thirty-two inches wide, and eleven inches deep, are good common dimensions) is to be lined with lead or zinc to make it water-tight; this trough is to be half filled with water, and over it is to be thrown a sheet of the India-rubber cloth as large as will be a complete lining to it if empty. The edges of this sheet are to be touched with spirit-varnish, to prevent the water creeping round by capillary attraction, and to be afterwards secured, in a water-tight manner, all round to the upper border or top of the trough, the only entrance left being through an opening at one corner, which can be perfectly closed. Upon this dry sheet a suitable mattress is to be laid, and a bed is thus constituted ready to receive its pillow and bed-clothes, and cannot be distinguished from a common bed but by its surpassing softness or yielding.

When an invalid is placed on this bed, the body, being (as is known to swimmers) nearly of the specific gravity of water, displaces water equal to his own body, in weight as well as in bulk, and is supported as the displaced water would have been. If a mattress of a certain thickness be placed under the body, after the weight of the body has forced two cubical feet (the average bulk of the human body) of that under the level of the water around, he will float with four-fifths of his body above the level, and will sink much less into his floating mattress, than in an ordinary feather-bed. If unusual positions be required, by having the mattress formed of different thickness in different parts, or by placing a compress of folded blanket or of pillow under the mattress in certain situations, any desired position of the body will be easily obtained.

The hydrostatic bed does not admit of the perspiration being carried off, and unless the invalid can leave the bed so as to admit of its being aired daily, like an ordinary bed, it is necessary to adopt a plan of ventilation in order to prevent the perspiration from being condensed on the water-sheet below. This Dr. Arnott has proposed to effect by placing under the mattress, arranged like the bars of a gridiron, small flexible tubes of copper wire, wound spirally, with their ends open to the atmosphere, either directly or through two larger tubes, crossing and connecting their extremities near the ends of the mattress, and then issuing at the corners of the bed from under the clothes.

This bed is therefore admirably adapted not only to every disease requiring long confinement to bed, but to cases of fractured bones, palsy, and diseases of the hip and spine. It also allows the patient, when capable only of feeble efforts, to change his position almost like a person swimming, and thus even to take a degree of exercise. It also enables the attendant to dress wounds, apply poultices, or to place vessels under any part of the body, as the elastic mattress may at any part be pushed down, so as to leave a vacant space, without the support being lessened for the other parts.

With regard to local applications, when the skin is merely inflamed without excoriation or detachment of the cuticle, the part should be frequently bathed with camphorated spirits of wine, or a solution of the acetate of zinc, or with a liniment made by triturating equal parts of alcohol and the white of an egg, and afterwards covered with soap cerate spread upon leather. When the skin is excoriated, spirituous applications are improper, the mildest emollients — the lin. calcis, simple cerate, or the zinc ointment—are suitable, and, if there be much irritation, an emollient poultice may be placed over the dressing.

When mortification, terminating in sphacelus, has taken place, a bread-and-water or carrot poultice is the best application, and if the separation of the sphacelus proceeds too slowly, a stimulant dressing, such as the resinous and turpentine before mentioned, may be applied for a short time, but it must be removed if it produce pain and irritation.

When the sphacelus has been completely detached, the sore is to be treated as a simple ulcer, the dressings being varied according to the state of the ulcerations.

A. T.
Adair Crawford.
A. Tweedie.

[The portion of this article which precedes the initials A. C is written by Dr. Crawford, and the succeeding portion by Dr Tweedie.]

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